First-year higher education students' acquisition of digital content creation literacies in discipline-specific settings

Thabisa Mayisela

MYSTHA003

Supervisors: Associate Professor Cheryl Hodgkinson-Williams

Associate Professor Cheryl Brown

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Abstract

Digital knowledge production involves the processing and presentation of digital information and content through the implementation of digital literacy practices in technical, cognitive and social-emotional dimensions. As such, this thesis addresses the question: How and why do first-year higher education students acquire digital content creation literacies in a discipline-specific setting? Firstly, this thesis contributes to the conceptualisation of digital literacy as a social practice through theorizing the complex and evolving nature of digital literacy practices in disciplinary-specific contexts in higher education. Secondly, the thesis develops a theoretical explanation to how higher education students acquire digital content creation literacies within their discipline-specific settings.

Drawing on the New Literacies Studies' theoretical approach, first-year students' digital literacy practices, in particular content creation literacies, are explored in relation to socio-cultural factors, and enablers and contradictions influencing their practices in discipline-specific settings. Additionally, Gee's (2008) principles of literacy and Discourse acquisition inform the analysis of student acquisition of digital literacy practices. An adaptation of Ng's (2015) digital literacy framework is applied as an analytical tool for categorising students' digital literacy practices and is further complemented by Engeström's (2001) second generation Activity theory framework when analysing the students' digital literacy practices involved in assignment writing (the digital literacy event). Using a case study design with a mixed methods approach, quantitative (a questionnaire) and qualitative (focus groups, interviews and student assignments) data is obtained from a total of 103 and 27 students respectively.

A key finding of this thesis is that discipline-specific learning and assessment activities (LAAs) instantiate individual and collaborative digital content creation and also drive the desire for students' acquisition of digital literacies for content creation. However, there are some 'actual processes' (Maxwell, 2012) that are not directly perceptible, such as student experience in using Information and Communication Technologies (ICT), age, volition, gender, course culture, historicity of practice and student histories of learning with ICT that influence student digital content creation practices. By the same token, this thesis highlights the importance of students owning or having technology access at university as lack of access is a constraining factor for their engagement in their LAAs.

The main contribution of this thesis is the finding that, when LAAs, which foster the acquisition of digital content-creation literacies are part of the curriculum, students can acquire the respective literacies through self-teaching, scaffolding from peers or senior students, trial and error, and engaging in practice within their disciplines, implying that there is no need for overt instruction as is the case of digital skills training isolated from the context of practice. The implication of this finding is that universities need to annually review first-year students' prior digital literacy skills and practices to inform the responsive adaptation of the LAAs. Additionally, universities require a deliberate strategy for collaboration between their academics, library staff, writing centre staff and professional development units on the integration of digital literacies for learning into the curriculum.

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I thank my family: my husband, Lukhanyo and kids - Avela, Awongiwe and Sivuyisiwe who supported me during this period. You were empathetic all the time and understanding when I could not spend quality time with you.

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Abbreviations and acronyms used in this research study

ADP	Academic Development Programme
ALA	American Library Association
ACRL	Association of College and Research Libraries
ANZIIL	Australian and New Zealand Institute for Information Literacy
AT	Activity theory
CCLILSG	Claremont Colleges Library Information Literacy Steering Group
CHAT	Cultural Historical Activity Theory
CR	Critical realism
DHET	Department of Higher Education and Training
HE	Higher Education
HEIs	Higher Education Institutions
ICDL	International Computer Driving License
ICT	Information and Communication Technology
IM	Instant messaging
IP	Intellectual property
JISC	Joint Information Systems Committee
JSTOR	Journal Storage
LAA	Learning and assessment activity
LMS	Learning management system
MMS	Multimedia Messaging Service
NSFAS	National Student Financial Aid Scheme
NLS	New Literacy Studies
NLSS	New Literacies Studies
NMC	New Media Consortium
OER	Open educational resources
PMD	Personal Mobile Device
RSS	Really Simple Syndication
SCONUL	Society of College, National and University Libraries

SMS	Short message service
SNS	Social networking sites
VoIP	Voice over Internet Protocol

Chapter 1: Overview of the research study

1.1 Introduction and background

This research study investigates how and why first-year higher education students acquire digital literacies and, particularly, digital content-creation literacies, within a discipline-specific setting.

With one of the functions of South African higher education institutions (HEIs) being to prepare graduates for undertaking research and producing knowledge in an endeavour to address economic, social and political challenges (Department of Higher Education and Training [DHET], 2013), it is imperative therefore for HEIs to explore potential means of developing student capacities in these areas. However, related to these areas, Altbach, Reisberg and Rumbley (2009) note how the the rapid development of information and communication technology (ICT) has revolutionised the ways in which knowledge in the higher education (HE) context is produced and communicated (Altbach, Reisberg & Rumbley, 2009). By implication, a digital knowledge production process requires digital literacy skills such as the ability to: use digital tools to access and communicate information (technical skills); question the authenticity, validity and usefulness of digital information (cognitive skills); and create content either individually or collaboratively with others (social-emotional skills), in digital spaces[1]

With respect to digital-content creation, ICT enables the creation and distribution of multimodal exclusively licensed (full copyright) and openly licensed resources. In the teaching and learning context, openly licensed resources include free teaching, learning and research materials, also referred to as open educational resources (OER), which are available under open licenses, such as Creative Commons[2]. That is, ICTs and open licences allow academics and students the opportunity to produce and legally redistribute digital content in the form of OER (loosely referred to as open content), rather than only consuming readily available exclusively licensed digital content that cannot be legally redistributed.

[1] https://natlib.govt.nz/schools/digital-literacy/understanding-digital-literacy/why-digital-literacy-matters
[2] https://hewlett.org/strategy/open-educational-resources/

For the purpose of this research, digital content may be any monomodal or multimodal content created, presented or stored in any format, which includes text, images/photos, video, audio, blogs, wikis, to mention a few. Digital content creation involves “creat[ing] and edit[ing] digital content to improve and integrate information and content into an existing body of knowledge while understanding how copyright and licences are to be applied” (European Science Hub, 2019:1). Digital information is the processed concepts and ideas cognitively generated from digital content (Zurkowski, 1974). Digital knowledge production loosely means the application of technical and cognitive skills in processing and presenting digital information (Bélisle, 2006).

Figure 1.1 illustrates a representation of the relationship between digital content creation, information processing and knowledge production.

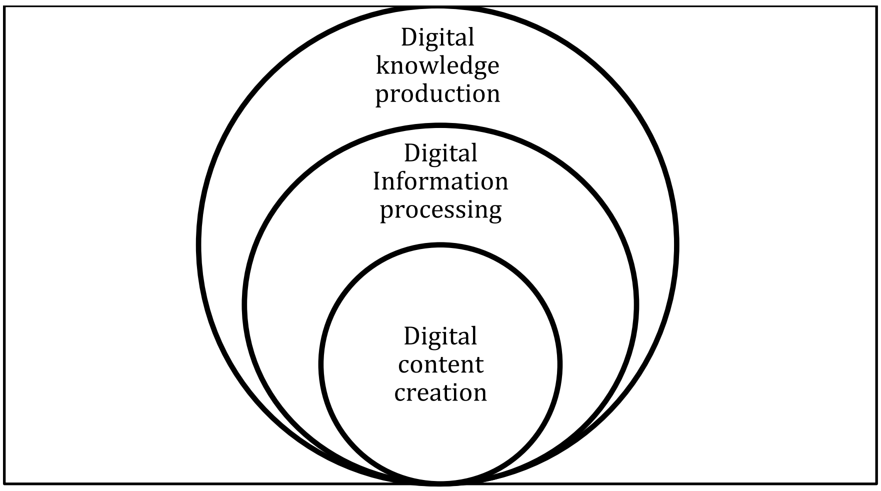

Figure 1.1: Relationship between digital-content creation, information processing and knowledge production

Irrespective of the digital content-creation enablers such as ICTs and open licences, it is common knowledge that, in teaching and learning environments, including HE, knowledge production is perceived as a role of educators and postgraduate students (Neary, 2008; Neary & Saunders, 2016).

Furthermore, some global studies reveal a knowledge production gap between the so-called global North and so-called global South (Bautista et al., 2010; Collyer, 2018). Although Bautista et al., (2010) study focused on knowledge produced in the global South (Argentina, Colombia and Peru) in the form of books, similar research shows that the global South also produces relatively less digital knowledge and information (content) than the global North (Hodgkinson-Williams, 2013; Arcos et al., 2015; Wu & Taneja, 2016). For instance, a network analysis of shared global traffic between 1 000 most popular websites, conducted by Wu and Taneja (2016), revealed that most of these popular websites were developed in the global North. The findings also revealed that, although there was an increase in internet usage in the global South, over the three intervals of their study (2009, 2011 and 2013), users were primarily consuming content on these websites (Wu & Taneja, 2016).

The same applies with OER production. Research shows that general production of OER (Hodgkinson-Williams, 2013), and more particularly, by academics (de los Arcos et al., 2015), is most predominant in the global North. Some documented work in the global South, particularly in South Africa is on postgraduate students assisting academics to create OER (Hodgkinson-Williams & Paskevicius, 2012; Hodgkinson-Williams & Paskevicius, 2013; King, 2017), while limited research is available on undergraduate students' creation and especially on collaborative creation of OER as one way of student knowledge production. The implication of this digital-knowledge-production gap is that the global South tends to consume digital-knowledge/information/content developed in the global North.

In the same vein, the notion of undergraduate students being capacitated to become producers (that is, collaborators) of knowledge instead of being merely consumers (that is, readers and spectators), loosely referred as 'Student as producer' (Neary & Winn, 2009), also originated in the global North, at Lincoln University, United Kingdom. Furthermore, in the global North, there have also been endeavours of developing students' 21st century skills for learning that are related to content creation, such as creativity and innovation, communication and collaboration, information literacy, media literacy and ICT literacy (Partnership for 21st Century skills, 2011). Very little is known about student knowledge or even content creation in the global South, more especially in South African universities. Research (Brown, Czerniewicz & Noakes, 2016) that drew on the notion of students as 'creative producers' described how undergraduate students in South Africa created digital content through blogging, contributing to wikis, editing and producing videos, filming and editing with smartphones[3] and designing e-portfolios in fulfilment of course learning activities. The current research study aims to further develop this knowledge by investigating the factors influencing first-year HE students' creation of digital content within a discipline-specific context.

I wanted to establish whether, how and why undergraduate students were creating digital content in their courses and if they openly licensed their materials, having been taught how to do so or not. Additionally, I was interested in determining how students could better acquire digital content-creation literacies in preparation participation in digital knowledge production in the global South.

1.2 Key debates about 'digital natives' and digital literacy in higher education

The digital literacy of young people has been under some contestation globally, with research supporting young people's inherent digital ability due to their age (Prensky, 2001; Tapscott, 1998) and cautioning against these assumptions (Kennedy et al., 2010; Jones & Healing, 2010; Bullen, Morgan & Qayyum, 2011; Jones, 2012). Below, is a review of literature on digital nativeness and digital differentiation; factors, other than age that have potential influence on higher education (HE) students' digital literacy practices; and the controversy around transferability and adaptability of digital literacy skills and practices within and across digital contexts.

1.2.1 Digital nativeness and digital differentiation

Technology enthusiasts refer to HE students of the 21st century, who they assume to have access to, and be proficient with, technology, as the 'Net Generation' (Tapscott, 1998) or 'digital natives' (Prensky, 2001; 2009; Palfrey & Gasser, 2008). According to Tapscott (1998), the 'Net Generation' is the generation of students who were born in the 1980s and whom he assumes to have grown up digitally. Similarly, Prensky coined the phrase 'digital natives' to refer to the 21st century generation of students who presumably grew up

[3] A mobile phone that operates on a smartphone platform (these include iPhones and Blackberry devices, as well as phones running the Android, Windows or Palm operating systems) https://www.pewinternet.org/2011/07/11/smartphone-adoption-and-usage/

surrounded by technology, and who are, by virtue, “native speakers of the digital language of computers, video games and the Internet” (2001:1).

It is in this context that the so-called ‘digital natives’ have been reported to have a high level of digital literacy, an innate ability to multitask, a preference for being networked, a preference for graphics over text and an investigative approach to learning (Tapscott, 1998; Prensky, 2001; Palfrey & Gasser, 2008). In their book, *Born digital: Understanding the first generation of digital natives*, Palfrey and Gasser (2008) further argue that the so-called ‘digital natives’ are confident in digital literacy practices, such as searching for information on Google by using keyword searches, skimming an overview of a topic on Wikipedia before reading it, and also creating new knowledge through contributing to Wikipedia pages. They are also reported to be creative producers who produce, edit and share pictures, music and videos (distributed on YouTube) online, and who confidently develop their online identities and, subsequently, live most of their lives online (Palfrey & Gasser, 2008). By implication, the characteristics of these so-called 'digital natives’ suggest the need for a customised approach to academics’ teaching practices (Prensky, 2001; Tapscott, 1998; Palfrey & Gasser, 2008) and the role of library staff (Palfrey & Gasser, 2008).

Educational researchers have argued against these presumptions, which they phrased as the “technology deteministic notion of digital nativeness” (Selwyn, 2009:371), that suggests that the academics change their teaching practices to include more technologies in response to the assumptions that digital natives: 1) have “sophisticated knowledge of and skills with information technologies” (Bennett, Maton & Kervin, 2008) and, 2) think and learn differently from earlier generations (Bennett, Maton & Kervin, 2008; Bennett & Maton, 2010). These researchers argue that irrespective of technology being embedded in young people’s everyday practices, their use of and skills with technology differ. In fact, in a subsequent chapter in the same book, Palfrey and Gasser (2008) criticised the overstatement of the generational notion and preferred to rephrase the concept ‘digital natives’, to ‘a population’ (p.14). These authors acknowledged that they realised a digital divide in terms of digital access and digital literacy skills between the developed and developing countries. Prensky (2009) also revisited the notion of digital natives and digital immigrants where he emphasised that “the distinction between digital natives and digital immigrants will become less relevant” (2009:1) because all age groups will have grown up in the digital era as we go further into the 21st century *(ibid).*

As far back as 2006, Peter and Valkenburg disputed the ‘digital divide’ phenomenon of ‘digital natives’ and ‘digital immigrants’, and proposed that the focus be shifted towards people’s engagement with technology (digital literacy practices) and, specifically, the internet. Peter and Valkenburg coined the term ‘digital differentiation’ to describe the “potential differences in the use of the Internet” (2006:294). Their work interrogated the ‘digital divide’ notion, which suggests that everybody who has access to the internet, “uses [it] similarly to get information, to connect with other people, and to find entertainment” (Peter & Valkenburg, 2006:296). These authors surveyed the Netherlands adolescents’ (13-18 years) use of the internet as a(n) information, social and entertainment medium. Results from this study revealed that the adolescents’ unequal access to socio-economic (the profession and the educational level of the family’s primary breadwinner), cognitive (the adolescent’s age and level of formal education) and cultural (the adolescent’s gender and ethnicity) resources led to differential use of the internet (Peter & Valkenburg, 2006). Although these adolescents may not be tertiary-going students, their study enlightens us that people engage with the internet in different ways. In the context of the current research study, their findings illuminate that digital literacy practices of students within the same generational group may be influenced by various factors rather than age exclusively. The next section describes some literature on factors that influence students’ digital literacy practices.

1.2.2 Factors with influence on HE students' digital literacy practices

A review of relevant research conducted in international and South African universities reveals that students’ technology-based activities (loosely referred to as digital literacy practices) were influenced by a variety of factors, other than age. A literature review conducted by Bennett and Maton (2010) revealed that student activities, such as communication, information access and content creation for both academic and everyday purposes varied across age groups and were also influenced by other factors, such as gender and socio-economic status. Bennett and Maton (2010) further elaborated that qualitative data from the studies they reviewed, revealed that student technology-based activities were influenced by students’ diverse interests, motivations and needs rather than their ‘digital nativeness'. This concurs with Jones and Healing's (2010) work, where they proposed an alternative account to the technology deteministic notion of digital nativeness that suggested that young people be viewed as active agents in the process of engagement with technology. They are of the view that the focus in any technology activity should not only be on the availability of technology, which could either enable or constrain human agency, but also on the agent (Jones & Healing, 2010). Furthermore, a survey conducted by Brown and Czerniewicz (2008) on students enrolled in six South African higher education institutions (HEIs) found that student use of ICTs for learning, such as e-mailing their lecturers, searching for online information (on the internet and databases), creating presentations and submitting word-processed essays, was influenced by their level of study; more of the postgraduate students than the undergraduate students undertook these activities. These researchers also found that student production and creation practices were influenced by their disciplines, where more students in the Business discipline than those students in Humanities produced digital media (Brown & Czerniewicz, 2008).

1.2.3 Transferability and adaptability of digital literacy skills and practices within and across digital contexts

There has been controversy in how digital natives adapt their everyday digital literacy practices for study purposes. International research (Bullen & Morgan, 2011; Margayan, Littlejohn & Vojt, 2011; Lai & Hong, 2015), as well as South African (Thinyane, 2010) reported that, although some digital natives used emerging technologies for personal activities, they did not use them extensively for learning purposes. A survey conducted with first-year students at the University of Melbourne, Australia, to elicit students' access to, proficiency with and use of a variety of technologies, technology-based tools and emerging technologies (including social networking, blogs, wikis, Really Simple Syndication [RSS], Voice over Internet Protocol [VoIP], and podcasting), revealed that although most of the students were digitally savvy with a variety of traditional and emerging technologies, their access patterns to, use of and preference to use these technologies for studies varied (Kennedy, Judd & Churchward, 2008). This variation in students' digital literacy practices could possibly be attributed to the differences in terms of the characteristics, of the personal and academic domains (Satchwell, Barton & Hamilton, 2013).

On the contrary, a study conducted by Gurung and Rutledge (2014), in a high school context, revealed that students transferred their everyday digital literacy practices to their educational context. However, they also highlighted that this transfer of practices created both a facilitative and obstructive role in the student learning context (Gurung & Rutledge, 2014). They concluded that it is important for educators to recognise, explore and promote students' digital knowledge and skills in the classroom (Gurung & Rutledge, 2014). At the same time, they also suggest that more empirical and theoretical research on how blurring the boundaries between personal digital literacy practices and educational ones facilitates or obstructs students' learning engagement (Gurung & Rutledge, 2014).

Along the same lines, studies have revealed that most of the digital-savvy students who engage in Web 2.0 technologies struggle to translate their technology skills into information literacy or other academic skills (Kennedy, Judd & Churchward, 2008; Kennedy et al., 2010; Šorgo et al., 2016; Thinyane, 2010). The study conducted by Šorgo et al. (2016), with students from the two Slovenian universities, to test the predictive strength of some attributes of 'digital nativeness' (ICT ownership, ICT experience, internet confidence and number of ICT-rich university courses) on information literacy, revealed that student ICT experience in different applications did not contribute to better information literacy.

Furthermore, some research conducted at international (Bennett & Maton, 2010; Ng, 2012a; Corrin, 2014; Gallardo-Echenique, 2014) and South African (Thinyane, 2010) universities revealed that very few first-year students created digital content (including videos, podcasts, websites) or contributed content to Wikipedia than would have been anticipated of digital natives. A related survey conducted by Kennedy et al. (2010) across three universities in Australia concluded that although students were regular users of social networking tools in their everyday context, they were neither frequent users nor skilled in media creation and editing applications, as it would be assumed. This implies that even those students who are considered to be digital natives still need capacity building with respect to digital-content creation, which is essential for digital-knowledge production.

In response to the above, research has shown that some so-called 'digital natives' only acquire digital skills for learning in response to curriculum requirements (Toliver, 2011).

Some students go to the extent of requiring educators' support on how to use and learn with educational technologies (Buzzard et al., 2011). Additionally, from a practice perspective, students are reported as having been better socialised into information literacy practices when information literacy was embedded into their first-year curriculum (Cooke, 2016). It is in this context that Ng (2012a) noted that students tend to create digital content only when content creation activities such as producing videos, keeping and updating blogs, and creating own websites are part of the curriculum and are assessed and graded by educators.

However, in relation to the above discussion, it is important to note that student access to digital technology is still a glaring challenge in a developing country such as South Africa. Research conducted by Brown and Czerniewicz (2010) in six South African universities, to determine students' access to and use of digital technology, revealed that students' access to digital technology and use thereof, was heterogenous across the surveyed sample. Therefore, contrary to the digital native notion, these researchers coined the term 'digital strangers' to refer to a group they identified in the research that was composed of mostly South African females who lacked both ICT experience and opportunities. This group had used a computer for fewer than four years during the time of the research and some either had no access or very poor access to ICTs off campus, where they could reliably use internet cafés, friends' and family's homes, or a community centre/library. It is along these lines that Brown, Haupt and Hunma (2018) note that South African universities students' digital technology access, capabilities and experiences cannot be assumed because these students come from diverse backgrounds and geographical locations.

The above discussion demonstrates that the generational classification is not an accurate means to describe students' digital literacy. Some critics of the concept of digital nativeness (such as Bullen & Morgan, 2011; Gallardo-Echenique et al., 2015), who also argue that technology access and digital literacy is not a universal condition, suggest that "it is time to put the digital natives discourse to rest and focus on digital learners" (Bullen & Morgan, 2011). These authors argue that students' digital literacy practices are influenced by the diversity of socio-cultural and institutional contexts. This implies that the focus of the digital learner perspective foregrounds the learner and environment factors, such as age, gender, experience, culture, institutional context, subject discipline, learning design and socio-economic background (Gallardo-Echenique et al., 2015). According to Gallardo-Echenique et al., 2015, the digital learner perspective:

1) focuses on "learners" rather than "persons", who should realise the possibilities and potentials of digital technologies in their environments and recognise the value of technology and the opportunity it presents the learner in his/her daily life,
2) argues that learners are not merely users or consumers of technology,
3) highlights the complexities of learners' technology experiences,
4) rejects the generational boundary and any chronological generations that exclude other types of actors who share similar practices (accept all learners),
5) does not assume any pre-defined learner characteristics, and
6) adopts a socio-cultural, anthropological, communicational and pedagogical approach from the learners' perspective (Gallardo-Echenique et al., 2015:172).

In this research, I adopt a perspective of digital learners, which acknowledges the agency of individuals as well as their socio-cultural conditions and contexts, and hence I adopt a critical realist view to understanding the potential factors influencing students' digital literacy practices, including digital-content creation.

As course curricula are potential fertile grounds for fostering and assessing digital content creation (Ng, 2012a) and other digital literacy practices (Toliver, 2011), this research study aims to investigate:

1) the personal and socio-cultural factors as well as enabling or constraining factors that potentially influence first-year HE students' digital literacy practices within their discipline-specific settings and
2) the contextal factors influencing how first-year HE students acquire digital-content-creation literacies if and when digital literacies, such as digital-content-creation literacies, are integrated into course curricula.

1.3 Research objective and questions

The objective of this study is to establish how and why higher education students acquire digital content creation literacies in a discipline-specific setting.

Research question

How and why do first-year higher education students acquire digital-content-creation literacies in a discipline-specific setting?

Sub-questions

The following sub-questions have guided the study:

1. What are first-year HE students' digital literacy practices in their discipline-specific settings?
2. What are the personal and socio-cultural factors that influence students' digital literacy practices in general, and digital-content creation in particular?
3. What are the enablers or contradictions influencing students' digital literacy practices in general, and digital-content creation in particular?
4. In what ways do first-year HE students acquire digital content-creation literacies in their discipline-specific settings?

1.4 Motivation and rationale for the research study

The motivation for this research study is to advance knowledge in how higher education students' digital literacy could be developed in an endeavour to prepare them become knowledge producers. This research study begins with contributing to the conceptualisation of digital literacy as there has always been a lack of common agreement in the literature about what digital literacy/ies is/are. A review of the literature reveals that there have been two perspectives of digital literacy: the autonomous and the ideological approaches. The former is normally adopted by learning technologists and policy-makers who tend to focus on affordances of digital technologies and the mastering of technical skills, while the latter underpins the literacy researchers' perspective, which focuses on social and cultural practices that are mediated by digital technologies (Brown et al., 2016). With the latter perspective, literacy varies from one social group to another, and what is recognised as literacy depends on the context of a particular group, implying that the socio-cultural context plays a crucial role in determining the literacy practice. The latter conceptualisation of digital literacy is adopted in the current research study.

By the same token, there has been an increasing call to focus on the digital literacy practices of university students instead of their mastering of technical skills (Hinrichsen & Coombs, 2013), but there is currently limited theoretical and empirical research on digital literacy as a social practice. Drawing on the social practice perspective, I understand that technical skills and other skill-sets are embedded in a practice. As such, I was inspired by Ng's (2015) digital literacy framework although, it separates skill-sets and knowledge from practices. It was therefore not entirely helpful with describing the situatedness of practices. Hence, I draw on Gee’s (1990; 2008; 2010) and Lankshear and Knobel’s (2003; 2006; 2008a) ideological conceptualisation of literacy to adapt Ng’s (2015) framework and subsequently replace the digital-competency dimensions with digital literacy practices dimensions. I also used Activity theory (AT), as a lens to study the practices and socio-cultural contexts, to describe the content creation system (digital literacy events) within a Commerce and Humanities discipline-specific context. According to Bullen and Morgan, (2011), “AT provides a means of looking at both social and educational contexts and a way of examining how these two contexts intersect or collide” (p.63), more so when the phenomenon being investigated is within larger units of analysis, such as learning institutions (*ibid*).

The rationale of this study is to make a theoretical contribution to how HE students acquire digital literacies in their discipline-specific settings. Currently, there is limited theoretical understanding of how students acquire digital literacies and practices for learning, including digital-content creation. Also, there is limited knowledge of the nature of a teaching and learning environment that could foster this acquisition. In this vein, Barton and Hamilton (2005) and Gee (2008) note how Scribner and Cole’s (1981) ‘practice account of literacy’ framework relates human practice and the development of skills, and in turn, how this relationship underpins the conceptualisation of ‘situated learning’ in literacy studies. To this end, I use Gee’s (2008) ways of acquiring literacy and discourses as a theoretical underpinning for students' acquisition of digital content-creation literacies within their disciplines.

The motivation for this research study emerged from my role as a digital literacy coordinator and involvement in a digital literacy project at a South African university committed to conceptualising ways of supporting first-year students to develop digital literacy. As part of the project, our university explored three approaches to fostering first-year student acquisition of digital literacies for learning. Firstly, at the beginning of each year, we routinely work with digital literacy tutors (called Tech Buddies) on ways of supporting first-year students to develop digital literacy. Secondly, our team provides self-training resources hosted on the university learning management system (LMS) for students to use at their convenience. Thirdly, I support academics who teach first-year courses to integrate digital literacies into their course curricula.

As such, a description that resonated with what we did in the digital literacy project was that of Alexander, Adams and Cummins (2016), published in the New Media Consortium (NMC) Horizon Report. The report was produced from research conducted in the United States HEIs on students' and academics' digital literacies. Three models of digital literacy emanated from their research findings, namely universal literacy, creative literacy and literacy across disciplines (Alexander, Adams & Cummins, 2016). Universal literacies involve a baseline set of technical, information literacy and media literacy practices that students need to be capable of carrying out in their learning endeavour and beyond. Creative literacies are those literacies that bring about a shift from consumption to production of digital content. The literacy across disciplines model focuses on the integration of digital literacies into the curriculum (Alexander, Adams & Cummins, 2016). The latter model resonates with the focus of this research, but it is important to note that the universal and creative literacies are equally important in enabling students to engage in digital literacies within their courses and disciplines. It is in this context that Koltay has noted that "digital literacy is composed of different literacies" (2011:217). Also, Lankshear and Knobel (2008a) recommend that digital literacy be perceived as "a framework for integrating various other literacies and skill-sets" (p.28), which is the approach that the current research has adopted. For the purpose of this research, digital literacy is taken to be the super-ordinate concept, with media and information literacy being part of digital literacy. It is in this context that I use Ng's (2015) digital literacy framework to help me define the three dimensions of digital literacy.

1.5 Outline of the chapters

Chapter 2 describes the conceptual foundations of digital literacy as a social practice. It further discusses how digital literacy relates to digital-knowledge production. The chapter also discusses literature on HE students' digital literacy practices for learning and the factors that influence these practices. It ends off with a discussion on the conceptualisation of digital literacies acquisition.

Chapter 3 first introduces the meta-theory, critical realism and describes how the critical realist orientation underpins the explanation of potential factors influencing students' digital literacy practices. The chapter discusses the theoretical perspective of digital literacy events and practices. Chapter 3 includes an introduction of, and justification for, the choice of the theoretical resource, AT, for analysing the digital literacy events of assignment writing and the associated practices. It concludes with a discussion on the theoretical underpinning of digital-literacies acquisition.

Chapter 4 explains the approach to the research design, the research methods, pilot study, data collection and analysis methods. It also describes the ethical and validity considerations and the arguments for the integrity of the findings.

Chapter 5 presents the empirical findings of this research study. This chapter presents data in relation to the four sub-questions. That means, in addition to student demographics and background, Part 1 presents data in response to sub-question 1 – student digital literacy practices in high school and their discipline-specific settings at university. Part 2 includes data on personal and socio-cultural factors that influence student digital literacy practices in the respective disciplines. Parts 1 and 2 also surface Part 3 data (in response to sub-questions 3) - The current enablers or contradictions influencing the students' digital literacy practices in their discipline-specific settings. Part 4 includes data that highlights the ways in which the students acquire digital-content-creation literacies in their discipline-specific settings through creation of content in their respective courses.

Chapter 6 includes a discussion of students' digital literacy practices in the technical, cognitive and socio-emotional dimension and the entanglement of the respective digital literacy practices. It also discusses the individual and socio-cultural factors, as well as enabling and constraining factors that influence student digital literacy practices at university. The chapter concludes that students acquire digital literacies for content creation through immersion in disciplinary learning and assessment activities.

Chapter 7 reviews the responses to the research questions. The chapter also outlines the contributions of this research study and recommendations for various stakeholders in HE.

Chapter 2: Conceptual foundations and literature review

“If there is no text, there is no literacy, and every text, by definition, bears content”
(Lankshear & Knobel, 2006:66).

2.1 Introduction

This chapter describes the conceptual foundations of literacy and, therefore, digital literacy as a social practice. It further describes how this perspective of digital literacy relates to discipline-focused digital-content creation and digital-knowledge production. The chapter also discusses literature on higher education (HE) students’ digital literacy practices for learning and adopts the notion of a digital learner which acknowledges that there are deep-seated personal and socio-cultural factors that influence these practices rather than age *per se*. This chapter also describes the conceptualisation of digital-literacies acquisition in discipline-specific contexts.

2.2 Knowledge production and digital literacy

In this digital era, the so-called ‘body of knowledge’ is no longer available as printed text only, but is increasingly accessible in a digital form. For Bélisle (2006), ‘digital knowledge’ is produced through the application of cognitive skills where humans draw in technological tools for processing and presenting digital information. According to Zurkowski, information (which could be presented to individuals in the form of printed and digital information resources) comprises “the concepts or ideas which enter a person's field of perception, [that] are evaluated and assimilated, reinforcing or changing an individual's concept of reality and/or ability to act” (1974:4). Hence, the cognitive skills (as outlined by Bélisle, 2006:57-58), such as “locating and identifying pertinent information; becoming aware of contexts; assessing the origin, the reliability and the accuracy of information; discerning, choosing and organizing relevant information; discriminating, interpreting, critically analysing; condensing, summarizing; modelling and structuring; critically evaluating, putting in perspective, comparing and pointing to specific characteristics”, are essential for producing knowledge from information. That is, knowledge production is a meaning-making process, which is primarily related to information literacy. For instance, the Claremont Colleges Library Information Literacy Steering Group (CCLILSG), USA, describes information literacy as "the ability to use critical thinking to create meaningful knowledge from information"[4].

Furthermore, Ng (2012a; 2015) provides a broader perspective of the cognitive skills required to participate in the digital age. Ng (2012a; 2015) describes a cognitive dimension of digital literacy where, in addition to the ability to critically handle (searching, evaluating, creating) digital information, she highlights other cognitive skills such as decoding and encoding digital information that is presented in various formats; evaluating and selecting appropriate software programs to do a specific task; and applying the ethical, moral and legal standards, (for example, copyright, academic integrity, attribution) associated with digital-content creation and reproduction (see Section 2.2.2 for Ng's cognitive dimension of digital literacy). These descriptions imply that with digital information (exclusively licensed and openly licensed) being largely available on the internet, and in different digital formats, users need to understand the legal permission involved when reproducing information (or content) or producing knowledge from information. That is, users also need to understand licences alternative to full copyright, such as Creative Commons (CC). The next sections provide a description of the generic concept of literacy and the digital literacy concept in particular, and how these concepts relate to each other and to digital knowledge production.

2.2.1 Literacy

Over time, the conceptualisation of literacy has shifted from that of the ability (skills) to read and write, to that of a social practice. Literacy researchers allege that the notion of literacy as the ability to read and write views literacy as the mastery of the technical skills for reading and writing, and also assumes that the cognitive ability of individuals is a consequence of literacy (Street, 1984; Gee, 1990).

According to Barton, in this approach:

> Literacy is seen as a psychological variable which can be measured and assessed. Skills are treated as things which people own or possess; some are **transferable skills**, some are not. Learning to read and write becomes a technical problem and the successful reader and writer is a **skilled** reader and writer. As an educational definition of literacy, this view is very powerful,

[4] http://libraries.claremont.edu/informationliteracy/

> and it is one which spills over into the rest of society. It is often drawn on in government strategies for literacy (Barton, 2007:11-12).

As such, this approach tends to polarise people as either literate, if one is a 'skilled' reader and writer, or non-literate, if one is not. Consequent to this polarisation is that literacy programmes are designed to foster the mastering of a progressive sequence of reading and writing skills components (Barton, 2007).

According to Street, a challenge with the approach described above, which he calls the 'autonomous' model of literacy, is that this approach assumes that literacy is "a neutral 'technology' that can be detached from specific social contexts" (1984:1). That is, this model of literacy assumes that technical skills automatically have effects on social and cognitive practices (Street, 2001). He argues that the autonomous model "disguises the cultural and ideological assumptions that underpin [literacy] and that can then be presented as though they are neutral and universal" (Street, 2001:7). Related to this debate, Street (1984) reports that the decontextualised literacy programmes that were offered by the so-called literate states to people who were considered non-literate in the UK, USA and Africa, were not useful to the trainees because they could not apply the acquired technical skills to their own contexts. The implication for educational and policy decision-makers is that they need to decide which literacy is to be imparted within a particular group (Street, 2001).

As far back as 1981, Scribner and Cole, who are known for their scholarly work on literacy, brought about a turn in the conceptualisation of literacy. They conducted ground-breaking research with the Vai community in Liberia to investigate how Vai script literacy[5] affected their cognitive skills. Scribner and Cole (1981) found that this notion of literacy had limited identifiable cognitive consequences on the Vai community, hence they concluded that the cognitive skills of the "traditional Vai people had been shaped by the range of literacy practices in the Vai society" (p.258). Informed by the Vai research, Scribner and Cole argue that:

[5] "Reading and writing the script was associated with specific skills in synthesising spoken Vai (auditory integration task), in using graphic symbols to represent language (picture reading and writing tasks), in using language as a means of instruction (communication board games, farm letters) and talking about correct Vai speech (grammar tasks)" (Scribner and Cole, 1981:244).

> The notion of practice guides the way we seek to understand literacy. Instead of focusing exclusively on the technology of a writing system and its reputed consequences ("alphabet literacy fosters abstraction" for example) we approach literacy as a set of socially organized practices which make use of a symbol system and a technology for producing and disseminating it (1981:236).

It is in this context that they assert that literacy is not a matter of simply knowing how to read and write, but rather, a way of "applying [situated] knowledge for specific purposes in specific contexts of use" (Scribner & Cole 1981:236). In this context, *knowledge* involves an individual's understanding of the shared cultural knowledge and conventional rules for engaging in a social practice. This means that literacy denotes "a set of socially organized practices" (Scribner & Cole, 1981:236) where a practice is described as a "recurrent, goal-directed sequence of activities using a particular technology[6] and particular systems of knowledge" (*ibid*). It is on this basis that (Gee, 2010) argues that literacy means ways of participation (engaging in practices) within a social group or community.

Furthermore, in their research with the Vai community, Scribner and Cole (1981) also learnt that "a [specific] type of literacy enhances quite specific skills that are practised in carrying out that literacy" (Gee, 1990:58). That is, the Vai people were more likely to acquire skills associated with the practices they carried out regularly, rather than cognitive skills as was the case with proponents of the so-called autonomous model of literacy. Drawing from this research, Scribner and Cole (1981), who acknowledge the influence of Vygotsky's work[7], developed a framework called 'a practice account of literacy' in an attempt to understand the relationship between socially organised activities (practices) and human cognitive skills. The framework tried to relate 'practice' to 'literacy-related skills' as Scribner and Cole explain:

> We use the term "skills" to refer to the coordinated sets of actions involved in applying this knowledge in particular settings. A practice, then consists of three components: technology, knowledge, and skills. … Whether defined in broad or narrow terms, practice always refers to socially developed and patterned ways of using technology and knowledge to accomplish tasks. Conversely, tasks that individuals engage in constitute a social practice when they are directed

[6] In simple terms, technology includes any mediating artefacts (such as tools, signs, language, techniques) for enabling goal-directed activities. For instance, in their research, Scribner and Cole elaborate: "We use the term technology broadly here to embrace characteristics of the graphic symbol system as well as the material means of representing it" (1998:319). Lankshear and Knobel emphasise that "technology isn't confined to digital, but includes a range of tools and techniques" (2006:65).

[7] Both authors edited the book: Mind in Society: The Development of Higher Psychological Processes, which is a translation of Vygotsky's work.

> to socially recognized goals and make use of a shared technology and knowledge system (Scribner & Cole, 1981:236).

According to these authors, the nature of practices and their technological aspects determine the kind of *skills* ("consequences") that are associated with literacy in a particular context (Scribner & Cole, 1981). This means that in order to identify the cognitive skills (or otherwise) required to carry out a particular practice, we need to consider the specific characteristics of that practice, and understand the larger social systems (for example, trade, agriculture, education) that generate the kinds of practices, and pose particular tasks for these practices (Scribner & Cole, 1981). The implication of the skills and practice relationship is that for one to engage in a practice, one may either draw on existing skills or, if necessary, may have to acquire the skills associated with the situated practice. That is, skills are a precursor of practices, but could also be a consequence of a literacy practice since they are embedded in the practice. Lankshear and Knobel (2006) provide a comprehensive description of this practice and skills relationship:

> Rather than simple cause-effect relationships between technology (e.g. literacy as a writing system) and outcomes (e.g. new skills, new kinds of knowledge and thinking processes, economic and social development), a concept and theory of practice sees all of these – technologies, knowledges and skills – as inter-related, dynamically connected to one another, and mutually evolving in conjunction with people's changing ideas about purposes and tasks Lankshear & Knobel (2006:65).

Drawing on Scribner and Cole's (1981) work, which serves as the basis for the ideological model of literacy (compared with Street, 1984:104), New Literacy Studies (Street, 2001; Gee, 2008; 2010) and New Literacies Studies (Martin, 2006; Lankshear & Knobel, 2008a) advocate for a social practice approach to literacy, against an autonomous one (skills-focused). Although, Lankshear and Knobel, (2006; 2008a) did not explicitly categorise their work as a new field, Gee (2010) refers to studies on new literacies, as New Literacies Studies (I use the acronym, NLSS; see Section 2.2.1.2). This conception of an ideological model of literacy posits that literacy is a social practice (Street, 1984; 2001). According to Gee (1990), the notion of an ideological model "attempts to understand literacy in terms of social practices and to theorize it in terms of the ideologies in which different literacies are embedded" (p.60). That is, literacy varies from one social group to another, and what is recognised as literacy depends on the context of a particular group, implying that the context plays a crucial role in determining the literacy practice.

Barton and Hamilton (2005) outline the social practice perspective of literacy and break literacy down into a set of points:

1) A literacy event point: The literacy event is the basic unit of analysis (Barton & Hamilton, 2005). According to Street (2001:10), a literacy event is "a particular situation where things are happening [literacy practices] and you can see them". Bhatt, Roock and Adams (2015:480) emphasise that a literacy event involves "observable and empirical activities integral to a text". That is, literacy researchers suggest that a literacy practice is instantiated by a literacy event (Street, 2001; Barton & Hamilton, 2005; Satchwell, Barton & Hamilton, 2013). Furthermore, Barton and Hamilton (2005:18) emphasise that "each literacy event is nested and can be broken down into a set of smaller activities". At the same time, events sometimes overlap, although each has a beginning and end (Barton & Hamilton, 2005).
2) A literacy practice point: Each event point is made up of "distinct, coherent configurations of practices which are … identifiable, nameable [and] culturally recognisable" (Barton & Hamilton, 2005:18) based on the contextual discourses. That is, literacy practices "are the general cultural ways of utilising literacy that people draw upon in a literacy event" (Barton, 1991, p.5 cited in Street, 1995:2). Hence, to make meaning of what is happening, you need to understand the context of the literacy practice, and nature or characteristics of the literacy event. For instance, in a university context "literacy practices are [primarily] activities around textual production – texts and practices which taken together are recognized as typical and purposeful for a community (such as research and publication, teaching and learning, academic services)" (Goodfellow & Lea, 2013:3).
3) A social structure point: Barton and Hamilton (2005) note that literacy practices or observable interactions are informed by their social patterning. Locating these literacy interactions into context helps us to identify decision-making power or agency that individuals exercise in their practices. That is, people make their practices meaningful within specific contexts and make choices within these constrained spaces (Barton & Hamilton, 2005:17-24).
4) A historical point: According to Barton and Hamilton (2005), every literacy practice that one could be examining at a given point in time, comes from somewhere. That is, they exist within a cultural historical context. For instance, most workplaces have

moved from print-based practices to computer-based practices, but some historical aspects of the print-based practices are still evident in their computer-based practices (Barton & Hamilton, 2005). In the context of this research, I use Jones' (2013) notion that courses' and disciplines' practices are constantly evolving and moving towards digital practices.

5) A dynamic point: According to Barton and Hamilton (2005), literacy events are dynamic activities and people are active participants who make choices and decisions in literacy events. Literacy practices change and are developed over time due to the contemporary nature of our everyday lives, workplace and education. These developments often require people to learn informally on-the-job by consulting their more knowledgeable peers, in addition to formal training, which may insufficiently address the participants' knowledge gaps (Barton & Hamilton, 2005). In the context of the current research, students have to constantly acquire the evolving disciplinary practices and digital technologies.
6) A multimodal point: Literacy is about meaning-making with the multimodal texts. Barton and Hamilton (2005) posit that literacy is one of a variety of semiotic resources that helps us interpret multimodal texts and interactions. These authors acknowledge that digital technologies are profoundly changing the semiotic landscape. That is, the focus is now on multiliteracies rather than, merely, just print literacy.
7) A recontextualisation point: The same text may be used within different contexts in which it yields different meaning (Barton & Hamilton, 2005).

In Chapter 3, I draw on the above discussion to describe the characteristics of digital literacy events and practices (see Section 3.3).

According to the ideological or social practice perspective, literacy is the "mastery of a secondary Discourse" (2008:176) of a particular community where a Discourse (with the capital D) is:

> A socially accepted association among ways of using language and other symbolic expressions, of thinking, feeling, believing, valuing, and acting, as well as using various tools, technologies, or prop that can be used to identify oneself as a member of a socially meaningful group or "social network" (Gee, 2008:161).

The notion of 'secondary' denotes that people are likely to acquire additional or so-called 'secondary discourses' when they engage with social groups (such as religious groups, school, community organisations) in later stages of life, beyond their initial socialising groups (such as family) that socialise them into 'primary discourses'. For the current research, the notion of a secondary discourse is useful in describing first-year university students' introduction into an additional discourse, when learning with technology, developing digital literacies and engaging with specific ways of writing within their disciplines. As such, literacy in the context of this research is about students' capability to master their disciplinary discourses (or academic literacies and digital literacies). This research study found the ideological model of literacy useful in trying to understand what student digital literacy means in their different disciplines (see Section 2.2.1.1).

McKenna (2010) noted how students' prior literacy practices (from high school and home environments) either overlap or fall below the expectation of the university disciplinary community to which they are seeking membership. She asserts that the overlap or gap between the literacy practices that students bring with them to the discipline in which they enrol, and the literacy practices of the discipline determine students' success (McKenna, 2010). In the digital literacy context, Goode (2010a; 2010b) notes how students' computing histories, which students accumulated prior to enrolling for university, influence their engagement in their university academic work. In light of the above, I understand that students have experience in different digital literacy practices prior to registering at university, hence it is of interest to understand this in the current study. Additionally, this research study attempts to also understand the different ways in which students acquire digital literacy skills and literacies for engaging in their disciplinary practices.

The next section describes how the concept of literacy relates to academic disciplines and their associated literacies.

2.2.1.1 Literacy and academic disciplines

According to McKenna (2010:12), the ideological model of literacy holds that HE disciplines' literacies are "a set of discourses determined by the [discipline] context of situation and culture". That is, the literacies are underpinned by the social values of the discipline (McKenna, 2010). She uses Becher and Trowler's (2001) metaphor of academic tribes (disciplinary tribes with common sets of practices) and territories (knowledge structures of disciplines) to describe how disciplines' literacies differ from one another. McKenna (2010) further argues that students should be socialised into the discourses of disciplines in order to acquire the norms and practices of the respective disciplines and, in so doing, gain membership into the disciplinary tribes. This implies that mastering of disciplinary discourses is, in McKenna's (2010) terms, 'cracking the code' of the disciplinary tribe, which leads to a form of recognition as a member of the disciplinary tribe. In the context of the current research, this means that a student who masters the disciplinary digital literacies would be considered as digitally literate.

There is a more established stream on literacy research in HE on academic literacy as compared to digital literacy. The focus in academic literacy research has been on students' academic literacy practices – "reading and writing within disciplines – [which] constitute central processes through which students learn new subjects and develop their knowledge about new areas of study" (Lea & Street, 1998:157). That is, this approach "takes account of the cultural and contextual component of writing and reading practices, and this in turn has important implications for an understanding of student learning" (Lea & Street, 1998:157). It is on this basis that Goodfellow and Lea talk of literacies – "the plural signals the multiplicity of contested and contextual, social, and cultural practices around reading and writing", (2013:5) instead of literacy. Lea (2013:111) further emphasises that in academic literacies research, the "plural literacies is used deliberately . . . to suggest a diverse range of practices that are not fixed or transferable but vary from context to context". The above implies that there is a variety of academic literacies within disciplines and these differ between disciplines. It is in this context that Kelly-Laubscher (2015) highlights that the teaching of academic literacies in HE has moved from the generic approach to a more discipline-integrated approach. This approach to teaching academic literacies embraces the notion of social practice, as Gee comments:

> The Scribner and Cole research clearly indicates that what matters is not 'literacy' as some decontextualised 'ability' to write or read, but the social practices into which people are apprenticed as part of a social group (2008:80).

However, Lea and Jones (2011) note the tension that arises when digital technologies are drawn into academic literacies, because of their capability to enable students to read and produce texts that are "hybrid, fluid and multimodal, offering possibilities for the integration of a range of texts in different modes" (p.380). Lea has explored this tension and argues that the term 'digital literacies' "has been stripped of its provenance and association with disciplinary knowledge production and textual practice" (2013:106). She suggests that as literacies encompass textual practices around reading, writing and learning in HE, digital literacies should describe ways of enacting these textual practices in digital contexts. This is what this research study attempts to understand as it motivates for a social practice approach to digital literacy (see Section 2.2.1.2 and 2.2.2). Therefore, the above discussion is useful in thinking about the relationship between academic and digital literacies, as well as the influence of disciplinary contexts on students' knowledge production and digital literacy practices for learning.

In his recent work, Trowler argues that "disciplines as articulated in a research context are different than when articulated in learning and teaching contexts" (2013:1725). Following two decades of the development of his work on the 'essentialism' of HE academic disciplines, Trowler (2013; 2014) reconceptualises the terms 'tribes' and 'territories'. This is subsequent to some critiques of his and colleagues' conceptualisation of disciplines over the years, where it has been contended that the term 'tribes' has "colonial roots and inaccurate and tendentious portrayal of native peoples" (Trowler, 2014:3). According to critiques, this conception assumes that all people act in the same manner (*ibid*). Additionally, Trowler argues that reference to the original use of the epistemological structures of disciplines (territories) is less relevant in the 21st century where there are many factors influencing HE discipline cultures, including technological innovations (Trowler, 2013). The development in the literature demonstrates that "disciplines are becoming highly complex and even more dynamic, they are shifting, boundaries are changing and there are more subdisciplines than ever" (Becher & Trowler, 2014:5). Hence, in his recent work he defines a discipline as follows:

> Disciplines are reservoirs of ways of knowing which, in dynamic combination with other structural phenomena, can condition behavioural practices, sets of discourses, ways of thinking, procedures, emotional responses and motivations. Together this constellation of factors results

> in structured dispositions for disciplinary practitioners who, in conjunction with external forces, reshape them in different practice clusters into localised repertoires (Trowler, 2014:6-7).

That is, he views disciplines as "malleable, as open, natural systems which are influenced in contextually-contingent ways by social and material [factors]" (Trowler, 2014:6) in academic departments, universities and more broadly (*ibid*). According to Trowler (2014), this conceptualisation of disciplines "gives less power to disciplines in conditioning practices" (p.6), as was the case in his and co-author's initial work. It is in this context that Trowler (2013) suggests moderate essentialism as opposed to strong essentialism that strictly categorises disciplines as hard or soft disciplines, pure or applied ones and so on and, as such, assumes predetermined causality. The tendency has been that research conducted from this premise eliminates the nuances in disciplines and ignores other HE contextual and individuals' factors that may influence individuals' social practices (Trowler, 2013).

Drawing on Sayer (1997), Trowler concludes that a form of essentialism in social science research is necessary for two reasons:

> First for reasons of conceptual clarity; because it is always necessary in research to categorise and distinguish between phenomena by identifying what they are and what they are not: to 'sort things out' (Bowker and Star 2000). Second, for reasons of explanatory power, because it is one of the tasks of social science to explain aspects of the world through establishing how the social world works, to show how phenomena are linked and to map the flow of causality (Trowler, 2013:1725-1726).

In the context of this research, while it is useful to understand how the nature of disciplines could determine the academic literacies and, in turn, digital literacies, I am also mindful that there are other contextual and student factors that could influence the students' digital literacy practices. Hence, this research aligns with the critical realist perspective in an attempt to establish potential factors influencing students' digital literacy practices "without presuming that they must be fixed" (Sayer, 1997:475). A comprehensive discussion of critical realism is provided in Chapter 3. The next section provides a background to research in literacy studies.

2.2.1.2 Background to New Literacy and Literacies Studies

Originally introduced in the work of Gee (1990), New Literacy Studies (NLS) referred to scholarly research from linguistics, history, anthropology, rhetoric and composition studies, cultural psychology, education and other areas that viewed literacy as "something people did inside society" rather than "inside their heads" (Gee, 2010:17). That is, "the NLS was about studying literacy in a new way" (Gee, 2010:31), rather than the "ability to read" and the "ability to write" (p.17). The 'new' way is about studying individuals' literacy practices – "… particular ways of thinking about and doing reading and writing in cultural contexts" (Street, 2003:79). The academic literacies practitioners and researchers also follow this route. For a long time, these NLS researchers have followed the socio-cultural research tradition (Lankshear & Knobel, 2003; Mills, 2010) that primarily used ethnography to study literacy practices in social and cultural contexts (Mills, 2010). A significant shift in this field came about during what Mills named, the 'digital turn', where there was "increased attention to new literacy practices in digital environments across a variety of social contexts, such as workplaces and educational, economic, and recreational sites" (2010:246-7). According to Mills, the digital turn has brought about developments in textual practices, more so, that "many cultural contexts of literacy practices involve digital technologies" (2010:249). As such, Gee emphasises that the focus is now on "new types of literacy beyond print literacy, especially, digital literacies …" (2010:31).

Related to the above, the New London Group comprised of 10 prominent literacy researchers, noted the changing social and classroom environments, which involve an increase in cultural, linguistic, communicative and technological diversity and, as such, calls for a new way of working with literacy. In 1996, the New London Group (1996) coined the term 'multiliteracies' in an attempt to settle for a common theoretical and pedagogical conceptualisation of the 1) various literacies modelled by different digital communications channels and media, as well as the prominence of cultural and linguistic diversity, and 2) multimodal textual practices and meaning-making within different contexts (p.63). Drawing on the above work, Mills (2010) advances the notion that textual practices, such as sending instant messages, creating websites, blogging, microblogging, contributing to wikis and digital media production, frequently involve multimodal texts (words used in combination with visual, audio, spatial, and gestural modes) that require new ways of meaning-making (p.248). In her book on the review of literacy theories for the digital age, Mills (2016) describes how researchers have used theories of multimodality to research the relationship between semiotic resources and people's meaning-making.

Furthermore, in both the first and second edition of their book: *New Literacies: Changing Knowledge and Classroom Learning*, Lankshear and Knobel (2003; 2006) introduced the notion of 'new forms of literacy', in addition to the new way of studying literacy. Similar to the other NLS researchers, these authors note that the use of 'new' signals a paradigm, or "a new approach to thinking about literacy as a social phenomenon" (Lankshear & Knobel, 2006:24). In addition to that, Lankshear and Knobel (2006) assert that the 'new' also refers to the ontology of literacies. They claim that these literacies are new in chronological terms and "are new to be realised – even within the socio-cultural perspective" (Lankshear & Knobel, 2003:25). These authors argue that:

> In simple language, we are using 'ontological' here to refer to the 'nature' or 'stuff' of new literacies. To say that 'new' literacies are ontologically new is to say that they consist of a different kind of 'stuff' from conventional literacies we have known in the past (Lankshear & Knobel, 2006:24).

Lankshear and Knobel (2003) identified two categories of new literacies. These are, on one hand, the 'post-typographic' textual practices that do not necessarily involve digital technologies, such as scenario planning, zines, multimediating, e-zining, meme-ing, blogging, map rapping, culture jamming, and communication guerrilla actions (Lankshear & Knobel, 2003:25-45). On the other hand, are new literacies that are mediated by digital technologies and multimodal texts. In relation to the digital turn, Lankshear and Knobel note that there are "new and changing ways of producing, distributing, exchanging and receiving multimodal text by electronic means" (2006:25). According to these authors, these call for new literacies "that are characterised by both the new technical stuff of digitization and the new ethos stuff of the second mindset, and more specifically, a Web 2.0 orientation" (p.93).

For, Lankshear and Knobel (2006), the 'technical stuff' includes "using and constructing hyperlinks between documents and/or images, sounds, movies, etc.; text messaging on a mobile phone; using digital semiotic languages (e.g. emoticons in email, online chat space or in instant messaging); manipulating a mouse to move around within a text; reading file extensions and identifying what software will 'read' each file; navigating three-dimensional worlds online; and uploading images from a digital camera or digital phone to a computer or to the Internet; inserting text into a digital image, building multimedia role play universes online; choosing, building or customizing a weblog template" (p.25). The new 'ethos stuff' are the literacies associated with Web 2.0 technologies, “which are often more ‘participatory’, more ‘collaborative’, and more ‘distributed’ (in terms of expertise and intelligence - authorship)” (Lankshear & Knobel, 2006:25). The Web2.0 technologies (such as Google.com, Google+, Wikipedia.org, MySpace Facebook, YouTube and Flickr.com) have an "implicit architecture of participation" (O’Reilly, 2007:22) that facilitates:

- collective intelligence and community or network building using web-based tools
- content creation (for example, on the Internet using WWW, Wikipedia)
- sharing of content through folksonomy (such as tagging - a style of collaborative categorization of sites using freely chosen keywords), social bookmarking (for example, using Delicious) and media sharing (for example, using Flickr[8] - a photo sharing service)
- aggregation using cloud-based technologies such as RSS
- blogging and micro-blogging (using Twitter)
- collaborative working and peer interaction (such as using cloud-based technologies) (O’Reilly, 2007: 22-26).

The above implies that Web 2.0 technologies facilitate ‘read-and-write’ practices in contrast to the predominantly ‘read-only’ practices that were supported by Web 1.0 technologies (Cardoso & Oliveira, 2015). As O’Reilly (2007) noted, Web 2.0 technologies are more of web applications whereas Web 1.0 technologies (such as Netscape) served as platforms for hosting content. Later on, Beetham et al. (2012) refer to these Web 2.0 technologies as open technologies because they are freely available and, as described earlier, provide open environments for collaboration and multimedia resource sharing. On the basis of the above discussion, the course socio-cultural context and technology tools could potentially influence student digital literacy practices.

With respect to research, Lankshear and Knobel (2003), however, acknowledged the challenge of aligning the above literacies with the NLS in an appropriate manner that does justice to them; “that does not water them down or leach the colour from them” (p.45). Mills (2016) notes that some researchers have used socio-cultural theories, such as the Cultural

[8] “Flickr thus allows users to set watch lists – any user can subscribe to any other user's photo-stream via RSS” (O’Reilly, 2007:26).

Historical Activity Theory, in conjunction with the socio-cultural approach to literacy research to study individual and social activities, as well as contextual factors influencing individuals' literacy practices in digitally-saturated environments (further discussion in Chapter 3).

In summary, on one hand, the NLS researchers consider 'text' as the "technology for giving and getting meaning" (Gee, 2010:31). That is, people read and write specific sorts of 'texts' in specific ways as determined by the values and practices of the social, cultural, institutional and historical organisation with which they are associated (Gee, 2010). For instance, when different social and cultural groups (such as lawyers, gamers, historians, religious groups, academic groups) engage in their practices, they tend to use the same text in different ways. This means that literacy is about "knowing how to use a text in the right place and time" (Gee, 2010:19). On the other hand, the NLSS researchers view technology as the "different kinds of tools and associated practices for giving and getting meaning" (Gee, 2010:22) as determined by social, cultural, institutional and historical aspects. In the context of this research study, students from different disciplines may use the same digital technology in different ways depending on the socio-cultural practices, such as in the teaching, learning and assessment activities at hand. That is, although NLSS theorists recognise the "significance of the digital in shaping the contexts within which literacy is to be understood" (Martin, 2006:16), the social practice determines the way a particular digital technology is used. It is noteworthy that this NLSS approach, as adopted by the current study, places emphasis on the literacy practices and, subsequently, on how digital tool affordances could be mapped to the socio-cultural practices.

The next section provides a description of digital literacy, digital literacies and digital literacy practices.

2.2.2 Digital literacy, literacies and literacy practices

The concept of digital literacy was derived during the era of the internet revolution and has been shifting definition. Different terms have been used for this concept in the literature, such as "information literacy; computer literacy – information technology or electronic or electronic information literacy; library literacy; media literacy; network literacy or internet literacy or hyper-literacy; digital literacy or digital information literacy" (Bawden, 2001:219). It is clear that digital literacy is an emerging phenomenon with which practitioners and HEIs are still grappling (Alexander, Adams & Cummins, 2016; Brown et al., 2016; Brooks & Pomerantz, 2017).

Gilster (1997), whose seminal work resonates with that of Scribner and Cole's (1981) on 'social context of literacy', has made significant contribution to literature around the concept of digital literacy by arguing that digital literacy is not simply the ability to read and write, but it is rather about the cognition of what one reads on the computer screen. Gilster (1997) loosely refers to digital literacy as "literacy in the digital age" (p.31) and describes it as "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (p.1). This cognitive aspect of digital literacy puts emphasis on an individual's ability to critically evaluate information (that is presented in different formats) and make decisions about how to use information in different real-life contexts, rather than the technical skills of how to access it (Gilster, 1997). That is, for Gilster, the cognitive phenomenon goes beyond developing skills to use the internet and network problem-solving tools – it is about "mastering ideas, not [computer] keystrokes" (1997:1). However, although Gilster's conceptualisation has made contributions in terms of moving the conceptualisation of digital literacy from the competency in digital tools to the cognitive use of multimodal information resources, there still seem to be some gaps in this conceptualisation. For instance, Gilster's conceptualisation of digital literacy has also been criticised for primarily focusing on information literacy when he views digital literacy as competence in:

- Internet searching – finding information on the internet;
- Hypertext navigation – ability to read and understand non-sequentially presented material;
- Knowledge assembly – gathering information presented in multiple formats (such as internet sources, printed text, radio, television and library material); and
- Content evaluation – evaluating information and is coupled with critical thinking (Bawden, 2008:20).

Martin, one of the authors who developed Gilster's (1997) conceptualisation of digital literacy, noted that digital literacy "may have some merit as an integrating (but not overarching) concept that focuses upon the digital without limiting itself to computer skills, and which comes with little historical baggage” (2006:18). Likewise, Bawden (2008) acknowledges that Gilster’s (1997) conceptualisation of digital literacy was a means of consolidating substantial sets of literature and practical experience around computer literacy and information literacy. Computer literacy has been associated with the ‘skills set’ or operation of computer hardware (such as keyboard) and software programs (Gilster, 1997; Bawden, 2008); whereas information literacy encompassed the “evaluation of information, and an appreciation of the nature of information resources” (Bawden, 2008:21).

Zurkowski (who draws on a practitioner perspective), in a submission to the US National Commission on Libraries and Information Science in his capacity as president of the US Information Industries Association in 1974, has been accredited to be the first person to describe information literates as those “people trained in the application of information resources to their work” (1974:6). He makes a distinction between the information literates and information illiterates:

> [The information literates] have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information solutions to their problems. The individuals in the remaining portion of the population, while literate in the sense that they can read and write, do not have a measure for the value of information, do not have an ability to mold information to their needs, and realistically must be considered to be information illiterates (Zurkowski, 1974:6).

Although, for Zurkowski (1974), the emphasis was on information literacy in the workplace, skills for utilising information resources have also, increasingly, been identified as essential for the learning context, more particularly in HE. As far back as 1989, the American Library Association (ALA) asserted that an information literate student is one who has the ability to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (ALA, 1989:1). They developed a six-step model of information literacy which described a linear process of information handling:

- recognizing a need for information,
- identifying what information is needed,
- finding the information,
- evaluating the information,
- organizing the information, and
- using the information (ALA, 1989:1).

This categorisation was further developed by the Association of College and Research Libraries (ACRL), a division of the ALA that noted that information literacy is a lifelong learning skill that enables students from any discipline to master content and conduct research effectively (Association of College and Research Libraries, 2000). The ACRL defined information literacy as "an intellectual framework for understanding, finding, evaluating, and using information" (2000:3). This widely-used information literacy competency standards framework for HE describes an information literate person as one who is able to:

- determine the extent of information needed,
- access the needed information effectively and efficiently,
- evaluate information and its sources critically,
- incorporate selected information into one's knowledge base,
- use information effectively to accomplish a specific purpose,
- understand the economic, legal, and social issues surrounding the use of information, and
- access and use information ethically and legally (ACRL, 2000:2-3).

Podgornik et al. (2016) provide a review of information literacy standards for higher education, such as 'The big six stages'; 'Seven faces'; 'ACRL five standards'; 'Joint Information Systems Committee Eight stages'; 'Australian and New Zealand Institute for Information Literacy (ANZIIL) six standards'; 'UNESCO six skills' and 'Society of College, National and University Libraries (SCONUL) Seven Pillars'. However, as Podgornik et al. (2016) note, the above standards focus on investigation, critical discernment, thinking and reasoning. A shortfall of this conception of information literacy is that it tends to be presented as a 'survival skill' for information consumers, who are expected to be proficient in finding, evaluating, organising and using information wisely (Eshet-Alkalai, 2004). For instance, Koltay summarised that:

> [Information literacy] emphasizes the need for careful retrieval and selection of information available in the workplace, at school, and in all aspects of personal decision-making, especially in the areas of citizenship and health (Koltay, 2011:215).

More recent developments in literature related to HE highlight that some institutions are attempting to incorporate aspects of the changing landscape of information resource (such as multimedia sources and open educational resources). For instance, the Claremont Colleges describe a first-year information literate student as one who is able to engage in the five activities: inquiry, evaluation, communication, attribution and being insightful (Claremont Colleges Library Information Literacy Steerng Group, 2013).

- Inquiry includes the “ability to understand and interpret assignment parameters; clearly define a research or information need; conduct basic information search strategies; develop a bibliography using resources beyond web-based or popular media sources”;
- Evaluation includes distinguishing types of information and resources and assessing quality of resources;
- Communication involves paraphrasing arguments and summarising information, and distinguishing between own ideas and those of others;
- Attribution involves avoiding intentional and unintentional plagiarism, citing and referencing sources of information; and
- Being insightful involves distinguishing between institutionally provided and open web resources, and “an emerging critical understanding of the social, legal, economic, and ethical aspects of information creation, use, access, and durability” (p.1).

Aspects to note in this framework are that it adds the element of open web resources and information creation rather than only use. Openness of web resources refers to an environment enabled by ICTs, particularly the internet, to allow people to contribute, share, collaborate, revise, remix and redistribute content on the web, and is also a place where open educational resources (OER) could live (Bond, 2015). An example of an open web resource is Wikipedia. I also find the description of communication as ‘paraphrasing arguments’ and ‘summarising information’, useful for the context of the current research, as it focuses on students’ textual practices, including writing.

In summary, on the definition of information literacy, in an attempt to bring together the various aspects attributed to the changing landscape of information resource and multimedia sources, the ACRL board has revised a working definition for information literacy for higher education:

> Information literacy is the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning (ACRL, 2015:3).

For the purpose of this research, which draws on the ideological model of literacy, information literacy is about: identifying the need for information to satisfy a particular goal (which serves as the context of information need), using manual systems (such as newspapers), and suitable information technology and appropriate criteria to critically find, evaluate, manage (includes organising and storing), synthesise; and ethically create, use, communicate and redistribute information.

Furthermore, due to the computerisation of information resources, there has been an overlap in concepts such as ‘library literacy’ and ‘media literacy’ (Bawden, 2001). According to Buckingham (2013), media literacy is the knowledge and skills associated with ‘reading’ and ‘writing’ media (Buckingham, 2013). It involves critical thinking in decoding, evaluating, analysing and producing information using mass media such as print and electronic media, including the internet (Bawden, 2001). Media literacy overlaps with information literacy in that information is often retrieved and presented as different multimedia elements such as text, images, audio, videos, maps and web content. It is in this context that Bawden (2001) emphasises that library literacy is a precursor to information literacy because library literacy only entails competence in library use (such as a systematic search strategy). In this research study, a student search for library resources is part of information search, an aspect of information literacy (as described above). The above discussion demonstrates that the conceptualisation of digital literacy is broader than just information literacy. It is in this context that Šorgo et al. (2016) note that, even recently, terms such as digital, media and information literacy have not yet been well defined in accordance with ICT developments, hence these terms are loosely used to describe knowledge and skills required to navigate media and information-rich environments.

In the same attempt to conceptualise digital literacy, Eshet (2002), like Gilster, concluded that digital literacy must be more than the ability to operate computer programs or evaluate digital information; “it is a special kind of mindset; a special kind of thinking” (2002:2) in the context of formal education. Eshet (2002) introduced the terms ‘photo-visual literacy’ (intuitively reading pictures), ‘reproduction literacy’ (copying, pasting, editing and distributing information) and ‘branching literacy’ (use of hypermedia and thinking) as a terminology framework for digital literacy. While Gilster (1997) viewed digital literacy as a life skill, not particularly associated with formal education, Eshet (2002) focused on the educational context. As such, Eshet concluded that there were two modes of approaching digital literacy in an educational context: “technological mode (using modem graphic interfaces; surfing the Web in non-linear ways), and the pedagogical mode (creating meaningful digits at reproductions of knowledge and critically evaluating information)” (2002:6).

In his later developments, Eshet-Alkalai (2004) argued that in addition to digital and cognitive skills, digital literacy also involves skills in the social and emotional dimension. In his second version of a model of digital literacy, Eshet-Alkalai (2004) described digital literacy as an integration of ‘five types of literacy’: photo-visual literacy, reproduction literacy, branching literacy, information literacy and socio-emotional literacy. His third version includes a sixth type of literacy; real-time thinking. According to Eshet-Alkalai Eshet (2012):

1) photo-visual literacy involves the cognitive skill of intuitively reading and understanding of visual representations;
2) reproduction literacy entails the creative creation, editing and remixing of existing, independent multimodal pieces of information such as text, audio, graphics, web-based information and blogs, and free and open information resources – such as Wikipedia and other OER, and distributing them. Creation may include writing for the web such as coding and designing applications (web authoring), games, virtual environments and interfaces (Mozilla group[9]; Beetham, 2015).
3) information literacy is the ability to access, evaluate and use web-based information;
4) branching literacy is knowledge construction from information presented in a non-linear manner on the internet;

[9] https://mozilla.github.io/content/web-lit-whitepaper/

5) socio-emotional literacy involves sociological and emotional behaviour while collaborating and sharing information in cyberspaces such as discussion groups, knowledge-sharing communities and social networks. These literacies involve the ability to discern how to share formal knowledge, share emotions in digital communication, identify deceptions and traps in online spaces and avoid malicious internet viruses. Socio-emotional literacy is about constructive social interaction in digital environments;
6) Real-time thinking is the ability to process and present information in real-time and at high speed. That is, it is the ability to react to various kinds of stimuli that appear simultaneously in different places on the monitor, to execute different tasks simultaneously (multi-tasking) and spontaneously adapt view and perspective according to needs of the environment (p.268-272).

Alongside Eshet's work and other research (such as Lankshear & Knobel, 2006; 2008a), Gilster (2006), noted the increasing overlap between content production and communication. Gilster posits that content used to be viewed as professionally published books and movies, while communications were viewed as material exchanged informally through letters, telephone calls and instant messaging, but with ICTs, including the internet, the two have become indistinguishable (Gilster, 2006:43). He highlights examples such as wikis, Wikipedia and blogs, which enable researchers and authors to reach their target audience. In the same book as Gilster, Martin (2006) provides a comprehensive description of digital literacy that includes information literacy, knowledge construction, media creation and communication. Martin describes digital literacy as:

> the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process (2006:166-167).

Drawing on Martin's (2006) broad definition, Eshet-Alkalai's (2004) five literacies, and the New London Group's notion of multiliteracies, Ng (2012a) describes digital literacy as a broad term that "embraces technical, cognitive and social-emotional perspectives of learning with digital technologies, both online and offline" (2012a:1066). For Ng (2012a), digital literacy is a result of the intersection of the technical, cognitive and social-emotional dimensions. In her recent work, Ng (2015:129) defines digital literacy as "the integrated cognitive, technical and social-emotional ability of an individual to competently use digital technologies across the various contexts of his or her life". This implies that "a digitally competent person is a digitally literate person who is able to use a combination of skills and knowledge thoughtfully to complete a task effectively using digital technology" (Ng, 2015:129). Below is a description of the three dimensions:

The technical dimension

The technical dimension involves both an individual's ability to carry out basic computer-based operations (operational literacy) and critical literacy. This dimension involves:

1) having knowledge of hardware and the ability to connect and use different computer devices. Connection includes using Bluetooth, wireless connections and data synchronisation.
2) the ability to adequately operate the features of software such as applications, productivity software, and internet (web browsers and search engines). This involves finding, downloading, installing (or uninstalling) applications, understanding issues around data charge costs associated with downloading web-based resources and applications, sending and retrieving e-mail attachments, sharing using cloud storage such as Dropbox or Google drive. This also includes using educational software tools that enable students to learn, perform and accomplish discipline- or course-specific tasks (Ng, 2012a; 2012b; Beetham, 2015). Also included are updating user account information on the internet, as well as setting up and using communication and social networking tools, such as email, blogs, wikis, Facebook, Twitter, short message service (SMS), multimedia messaging service (MMS) and instant messaging (IM) tools.
3) the ability to troubleshoot, where individuals read manuals, use 'Help' functions or critically search for web-based resources (such as on Google or YouTube) to help them learn how to operate specific software (Ng, 2012b; 2015). Ng (2012a; 2015) notes that searching the web requires critical skills such as keying in the appropriate question or phrase in the search engine. Additionally, the response requires the user's ability to read and understand text-based instructions, images and videos on how to go

about solving the problem at hand. That is, working with multimodal text taps into the user's cognitive skills.

The cognitive dimension

For Ng (2012a; 2012b; 2015), the cognitive dimension involves the ability to: use the internet effectively for information gathering and knowledge synthesis, evaluate and select appropriate software programs or applications fit for purpose and to understand multiliteracies.

1) An individual's ability to evaluate and choose appropriate software with which to learn is about selecting the most appropriate feature or functions within a software program (instead of purchasing or downloading specialised software), to solve problems or to demonstrate understanding of knowledge acquired (Ng, 2012b). According to Ng (2015), users may also read up on the internet about tools or ask targeted questions that could help them make informed decisions.
2) The ability to use the internet effectively for information gathering and constructing knowledge includes critically searching, evaluating and using digital information and resources. Searching and locating web-based information becomes more effective when using appropriate browsers and search engines, and using Boolean operators, such as 'AND', 'OR' and 'NOT', and precise keywords (Ng, 2015). Evaluating information involves checking for accuracy, currency, reliability, objectivity, credibility of authors (ALA, 2000; Ng, 2015). Critical literacy with regard to information use is about understanding the authors' motivation and bias in the message they convey through the information resource. Linked to information gathering is managing the information (Ng, 2012a; 2015). Beetham (2015) emphasises the capability to: aggregate the information gathered from individual information resources, manage and curate (such as using social bookmaking). These are essential skills for 'knowledge assembly' (Gilster, 1997; Bawden, 2008).
3) According to Ng (2015), in addition to information consumption, the cognitive dimension also involves content creation, in the form of web-based resources or digital artefacts. As such, the use of information requires the knowledge about the ethical, moral and legal issues (for example, copyright, academic integrity, terms and conditions) associated with content creation (Eshet-Alkalai, 2004; Ng, 2012a; 2015).

Additionally, with the advent of OER, Beetham (2015) emphasises the knowledge of Creative Commons licences, which are an alternative to full copyright licences. Although Ng (2012a; 2015) loosely refers to the above description as information literacy, for the purpose of the current research study, the broader definition (as described above) is used.

4) An understanding of multiliteracies involves the ability to interpret, decode and create meaning from multimodal texts (Ng, 2012a; 2015). That is, multimodal resources require multiliteracies for comprehending multimodal representations, such as photo-visual, audio (such as sound bytes or podcasts), spatial (such as maps and 3D models), gestural (such as emoticon and video-captured actions), linguistics (written materials) (Ng, 2015). By implication, multiliteracies often encompass media literacy. Drawing on the multiliteracies perspective, Hague and Payton emphasise that decoding multimodal texts requires "an understanding of the social and cultural practices that surround their creation" (2010:41). Similarly, these literacies are required for producing multimodal resources. Hence, according to Beetham (2015), 'media literacy' or 'multimodal literacy' involves acknowledging sources of content and observing licencing when editing, repurposing and sharing digital media.

The social-emotional dimension

The social-emotional dimension involves the psychological and sociological aspects of human interaction in digital spaces (offline and online spaces) (Ng, 2012a). Offline digital interactions may include non-web-based instances such as sharing digital content using Bluetooth technology and applications. Online digital interactions may include e-mail or use of social media – "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content (UGC)" (Kaplan & Haenlein, 2012:101). By implication, social media[10] enables individuals to create and exchange UGC for social and learning purposes or otherwise. Hence, according to Ng (2012a; 2015), digital literacy in the social-emotional dimension is about the ability to critically use the internet responsibly for communicating, socialising and learning.

[10] According to Kaplan and Haenlein, "social media is much broader than simply collaborative projects such as Wikipedia and also includes blogs and micro-blogs (for example. Twitter), content communities (for example, YouTube), social networking sites (for example, Facebook), virtual game worlds (for example. World of Warcraft), and virtual social worlds (for example, Second Life)" (2012:101).

This includes:

1) “observing ‘netiquette’ through the application of similar rules as in face-to-face communication such as respect and using appropriate language and words to avoid misinterpretation and misunderstanding” (Ng, 2012a:1068);
2) protecting individual safety and privacy by managing one’s identity (such as being cautious of the digital footprint one leaves) and “keeping personal information as private as possible and not disclosing any more personal information than is necessary” (Ng, 2015:137);
3) recognising when one is being threatened by fraudsters, scammers, identity thieves, cyberbullies and stalkers, while knowing how to deal with it (Ng, 2012a: 2015);
4) the ability to interpret the tone of messages correctly; and
5) balancing the amount of time spent on social networking sites as a means of saving text messaging costs as well as preventing social networking addiction (Ng, 2015).

At the intersection of the cognitive and technical dimension are the branching literacy, reproduction literacy and ethical literacy (Ng, 2015). Branching literacy involves the ability to use hyperlinks for constructing knowledge from information presented in a non-linear manner such as on the internet. At the same time, this is an important aspect when designing a web page; “Hyperlinks to topics or sections need to be logical and well organised in order to ensure that the audience is not overloaded cognitively in trying to navigate through the pages to learn” (Ng, 2015:139). Furthermore, interrelated to digital content creation literacy, is reproduction literacy – editing, remixing of existing, independent multimodal pieces of information and digital artefacts, and distributing them (Eshet, 2002; Eshet-Alkalai, 2004). That is, “A range of original [fully copyrighted and openly licensed] materials are copied, cut spliced, edited, reworked, and mixed into new creation” (Lankshear & Knobel, 2006:76). In their edited book, Lankshear and Knobel (2008b) also describe Lawrence Lessig’s (a Creative Commons advocate) notion of digital remixing as a contemporary form of writing. This discussion, therefore, suggests that the techno-cognitive dimension also involves the capability to ethically and morally share, reproduce and distribute digital information and content – ethical literacy (Ng, 2015). Similarly, these practices underlie the production and dissemination of OER. For instance, in addition to the above, Wiley (2014) talks of re-using content (‘as is’) in a range of ways, revising content and redistributing content. According to

Wiley (2014), revising includes adapting or modifying content, while redistributing involves sharing copies of your revisions or your remixes with others.

At the intersection of the cognitive and social-emotional dimensions are online etiquette literacy and cybersafety literacy. According to Ng (2015), being cybersafety literate involves the cognitive and affective ability of an individual to recognise when there is threat and decide on the appropriate actions to take, as well as being sensitive about others' emotional state when conversing and editing or commenting in social media networks and on collaborative work respectively. Critical literacy involves the ability to analyse cues of content and tones of messages, including abbreviations used in SMS and IM. Ethical literacy is about understanding how one's actions and messages could impact on another individual's welfare (Ng, 2015).

At the intersection of the technical and social-emotional dimension is social networking functional literacy, such as the ability to effectively navigate through social media sites and to use the technologies of these services sensibly for socialising and learning (Ng, 2015).

Figure 2.1 is an illustration of Ng's (2015) digital literacy framework.

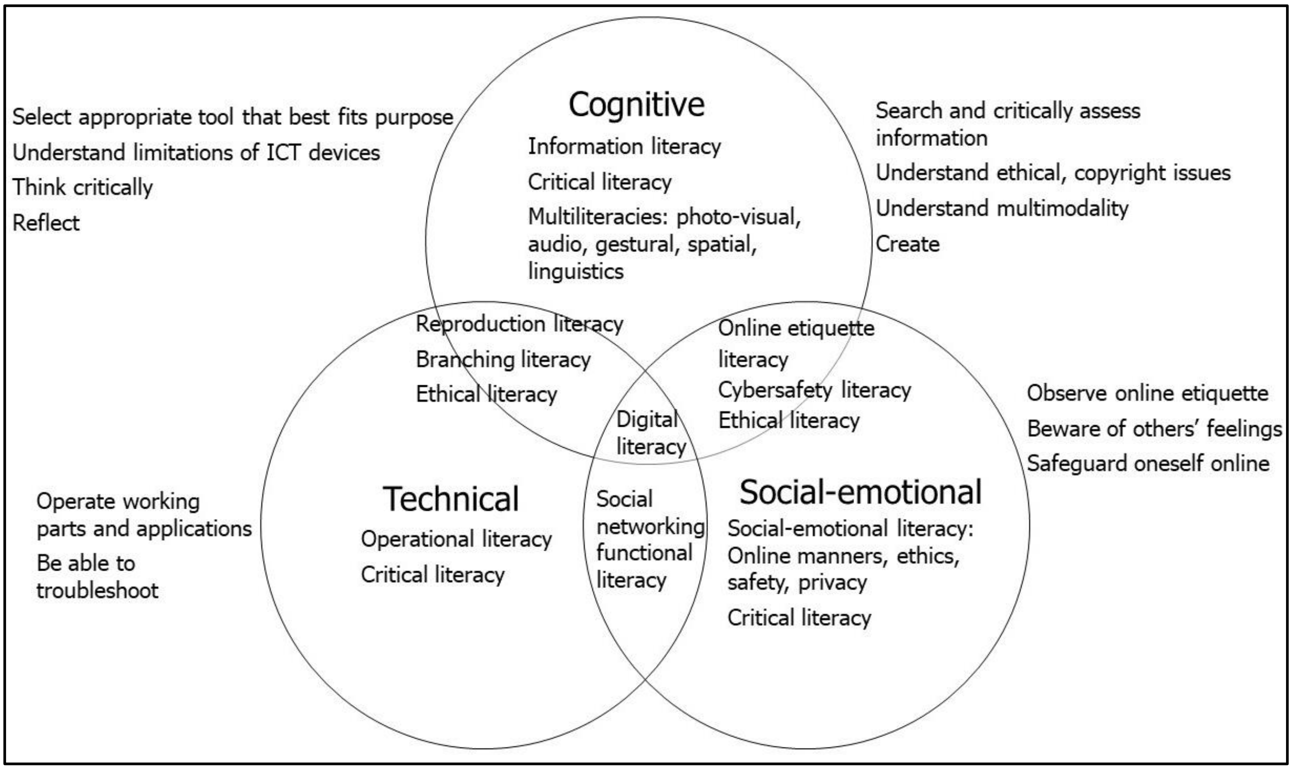

Figure 2.1: Digital literacy framework (Ng, 2015:130)

This digital literacy framework adds an empirical value for operationalising digital literacy in the current research. I found the digital literacy dimensions, their respective elements and the intersections between dimensions useful for describing the complexity of digital literacy. At the same time, the framework was useful for conceptualising the essential, intertwined competences for digital knowledge production. However, Ng's (2015) conceptualisation of digital literacy focuses on digital competence – "digital literacy is the construct that sustains the competent use of digital technology across the various contexts throughout an individual's life" (2015:128). In her digital literacy framework, Ng's (2012a) had the digital literacies placed within the circles whereas, in her later development, Ng (2015) separated the competences - one's ability to apply the skill and knowledge (placed within the circles) from the practices (placed outside the circles). This arrangement seems to suggest that competence and practices exist distinctively from one another.

With the current research adopting an ideological perspective of literacy, where literacy is conceptualised as "a set of social practices, each of which is embedded in a specific context and underpinned by social values" (McKenna, 2010:12), digital literacy is more than digital competence. For the purpose of this research study, I draw on authors who have developed Scribner and Cole's (1981) notion of 'literacy as a set of socially organized practices', such as Lankshear and Knobel (2003; 2006; 2008a; 2008b) and Gee (1990; 2008; 2010). For instance, Lankshear and Knobel describe literacy as a "family of practices – literacies – that include … socially evolved and patterned activities" (2008b:256). By the same token, Gee (2008) asserts that literacy is the 'mastery of Discourses' (as discussed above).

Underpinned by the above definition of literacy, Lankshear and Knobel argue that "digital literacy can usefully be understood as digital literacies – in the plural" (2008a:2). They claim that "approaching digital literacy from the standpoint of digital literacies can open us up to making potentially illuminating connections between literacy, learning, meaning (semantic as well as existential), and experiences of agency, efficacy, and pleasure that we might not otherwise make" (Lankshear & Knobel, 2008:9). That is, when we view digital literacy as competency. These authors further interpret Gilster's definition of digital literacy – "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (1997:1) to relate to the concept of digital literacies, meaning that digital literacies "will take diverse forms according to the many and varied social practices out of which different individuals are enabled to understand and use information and communications" (Lankshear & Knobel, 2008a:29). By the same token, Gee explains digital literacies as "different ways of using digital tools within different sorts of sociocultural practices" (2010:32). It is in this context that Gillen and Barton (2010) provide a broad definition of digital literacies: "the constantly changing practices through which people make traceable meanings using digital technologies" (p.9). They argue that:

> This social practice view of digital literacy possesses continuities with a social practice view of literacy in general. This is one which starts from what people do, the meanings they ascribe to their activities and the ways they use reading and writing in their broadest senses to achieve their purposes (Gillen & Barton, 2010:9).

Furthermore, Gillen and Barton (2010) note that, among other factors, these evolving practices are influenced by domains of life, the institutions that shape, sponsor and support them, and issues of access and power. The above implies that when we study student digital literacy practices, we are taking a snapshot of practices at a particular point in time. This is useful for the interpretation of findings in the current research study.

In light of the above discussion, in the current research, digital literacy practices are loosely defined as evolving textual practices within socio-cultural contexts, that are supported by diverse and changing digital technologies (Gillen & Barton, 2010; Joint Information Systems Committee [JISC], 2014). Digital literacy depicts a set of digital literacy practices (Lankshear & Knobel, 2008). I adapted Ng's (2015) digital literacy framework to represent digital literacy practices in the three dimensions. In short, digital literacy is a mastery of digital literacies, where digital literacies are the socially evolved ways of using digital technologies within discipline-specific practices (Lankshear & Knobel, 2008a; 2008b; Gee, 2010). Therefore, to be digitally literate means the mastering of discipline-specific digital literacies. Hence, to pin down the digital literacies valued by each discipline, I studied the student digital literacy practices in two courses. Furthermore, for the purpose of this research, digital content creation involves designing and creating any form of digital content (monomodal and multimodal), where creation includes creating content from scratch or reproducing existing content. Therefore, drawing on the above description of digital literacies, digital content creation literacies are the socially evolving ways of creating digital content within disciplines.

Figure 2.2. below illustrates the adapted digital literacy practices framework with examples of digital literacy practices.

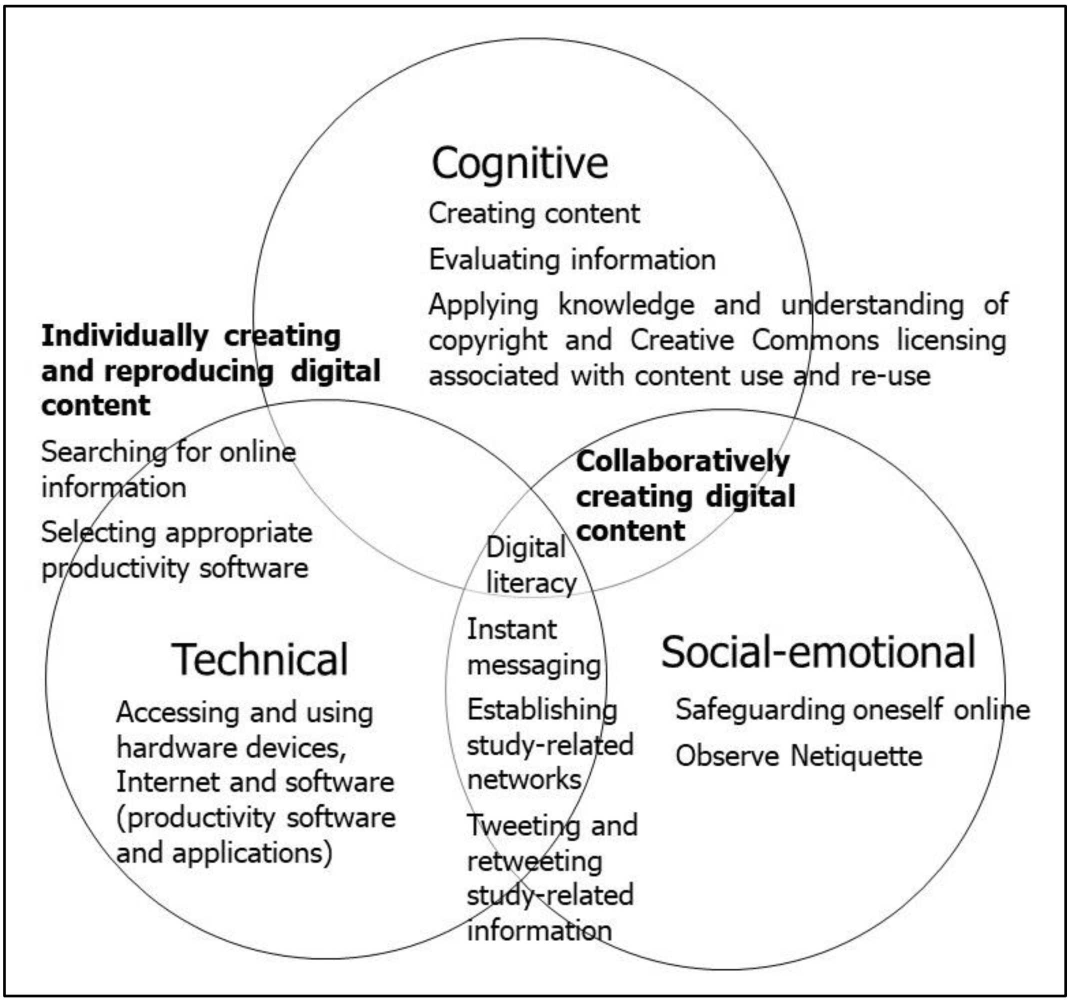

Figure 2.2: Digital literacy practices framework

The two areas of focus in this research are the individual and collaborative creation and reproduction of digital content (are in bold in Figure 2.2 – at the intersection of the technical and cognitive dimension, and the cognitive and social-emotional dimension). This framework informed the development of the data collection tools, and I also used it as an analytical tool to help me identify, locate and name student digital literacy practices (see Chapter 4 and Chapter 5).

In the light that "digital literacy can be developed at the same time as students develop their subject knowledge" (Hague & Payton, 2010:20), I am aware that students may not engage the same way in all three dimensions due to the nature of the course disciplines. As such, they may acquire digital skills associated with the digital literacy practices relevant to their disciplines and, therefore, become digitally literate in those respective dimensions. I am also aware that students may be more confident in digital literacies in one dimension as compared to the other. It is in this context that the central overlapping space representing digital literacy is premised on Lankshear and Knobel (2008:256) notion of literacy – "a family of practices – literacies – that include … socially evolved and patterned activities". With this being said, there is still a theoretical gap in understanding how students acquire digital literacies.

The next section describes aspects of knowledge production and the notion of students as knowledge producers in relation to the concept of digital literacy.

2.2.3 Students as producers – digital content production and HE students' digital literacy practices

Two dominant concepts have been identified in the literature: 'Student as producer' (Neary and Winn, 2009) and 'Student as creative producer' (Noakes, Czerniewicz & Brown, 2013). The concept of 'Student as Producer' emanated from the University of Lincoln (Neary, 2010). This notion emphasises "the role of the student as a collaborator in the production of knowledge" (University of Lincoln website)[11]. Principles of student knowledge production include:

1) Discovery: students learn through their own research and inquiry rather than through traditional models of knowledge transmission;
2) Collaboration: learning is more productive when it is collaborative rather than individual, so students work together to develop knowledge and understanding;
3) Engagement: students become engaged in their discipline through discovery-mode learning, developing their identity as a member of a disciplinary community; and
4) Production: students are producers of knowledge rather than consumers of education (Neary & Winn, 2009).

Neary and Winn (2009) also suggest that these collaborations and the sharing of content should ideally be open. That is, the notion of 'Student as producer' is grounded in the human attributes of creativity and openness (Neary & Winn, 2009). International examples of such

[11] http://studentasproducer.lincoln.ac.uk/

practices include Lincoln University[12], Vanderbilt University, USA[13], and the University of British Columbia[14] where students are co-creators of learning objects.

However, the notion of students being producers of digital content and knowledge seems to be at its early stages of uptake. For instance, both international and South African empirical research has revealed limited student use of collaborative knowledge creation tools and social networking sites (SNS) for content creation. A qualitative study conducted by Green and Hannon (2007) with children and young people in the United Kingdom revealed that the respondents were involved in creative production digital literacy practices, ranging from "uploading and editing photos to building and maintaining websites" (p.10). Green and Hannon used the participants' reported digital literacy practices to categorise their digital identities into:

1) 'digital pioneers' who were blogging before the phrase had been coined;
2) 'creative producers' who built websites, posted movies, photos and music to share with friends, family and beyond;
3) 'everyday communicators' who made their lives easier through texting and MSN; and
4) 'information gatherers' who were Google and Wikipedia addicts, 'cutting and pasting' as a way of life (2007:11).

According to Green and Hannon, these practices emanated from self-motivation, sense of ownership of project (such as creating own website), self-initiated goal-directed purpose and peer-to-peer (informal) learning.

There were some promising findings from a South African study, where Noakes, Czerniewicz and Brown (2013) presented literature from HE studies on how students created digital content through blogging, contributing to wikis, editing and producing videos, filming and editing with smartphones and designing e-portfolio in fulfilment of course learning activities. Furthermore, a finding of their ethnographic study of two third-year university students revealed that the students' self-determination and agency drove their motive of connected learning across different settings, particularly in creative production. The students used

[12] http://edeu.lincoln.ac.uk/sharing-practice-projects/
[13] https://cft.vanderbilt.edu/2013/09/students-as-producers-an-introduction/
[14] https://ctlt.ubc.ca/2013/09/27/ubc-course-offerings-feature-students-as-producers-of-content/

writing platforms to write and share their poetry and personal journals; they micro-blogged using Twitter, and shared their video creations through YouTube and Vimeo (Noakes, Czerniewicz & Brown, 2013). The above practices suggest a need to encourage students' confidence in digital literacy practices within and across personal and academic settings.

However, the limited literature on digital content creation suggests that there is dire need for research about enhancing students' digital literacy, more particularly for formal learning contexts, as students need to be capable of carrying out multiple digital literacies in an attempt to create digital content and knowledge. The next section provides a literature review of HE students' digital literacy practices and factors influencing the practices.

2.3 Higher education students and digital literacy practices

A review of research on HE students' digital literacy practices for learning reveals that digital learners' practices are influenced by more deep-seated factors rather than age *per se.* These factors include the nature of the discipline in which students enrol at university, learning and assessment activity (LAA), students' experience in using technology prior to enrolling for university, gender and technology access at university.

International (Selwyn, 2008; Bullen, Morgan & Qayyum, 2011; Margayan, Littlejohn & Vojt, 2011) and South African (Brown & Czerniewicz, 2008; Thinyane, 2010) studies revealed that disciplines and academic courses tend to be influencing factors for student digital literacy practices. For instance, a survey conducted with a stratified sample of undergraduate students at UK universities during the 2006/7 academic year revealed that subject discipline differences were influencing factors for undergraduates' use of the internet (Selwyn, 2008). Also, a study conducted by Bullen, Morgan and Qayyum (2011) with second-year students at a public technical and trades training institute in Canada revealed that the nature of the program for which students were enrolled and the task at hand determined the students' technological choices. Another study, conducted by Margaryan, Littlejohn and Vojt (2011), with third-year Social Work and Engineering students at two UK universities, revealed that the nature of the discipline had an influence on how students engaged with Web 2.0 tools. Although, in both courses, the use of collaborative knowledge creation tools, virtual worlds, and SNS was lower than it would be expected of digital natives, the Engineering students used more technology tools as compared to the Social Work students (Margaryan, Littlejohn & Vojt, 2011). Irrespective of this being a study with third-year students, it elaborates upon the significance of the course context on student web-based activities and therefore applicable to the current study.

In a South African context, Brown and Czerniewicz (2008) reported that the use of web-based technologies (such as web searching and instant messaging) was influenced by course contexts (and LAAs thereof), such as scaffolded learning activities and research-based e-learning activities in undergraduate and postgraduate studies, respectively. The same applies to findings from Thinyane's (2010) study, which revealed that the two most frequent web-based activities were emailing and accessing course websites (which were course requirements) as compared to other web-based activities that were undertaken for personal purposes.

The study conducted by Bullen, Morgan and Qayyum (2011) revealed that students' use of ICTs for learning was influenced by student familiarity with, and experience in, using digital technology for social purposes. For instance, the students used Facebook for their group-work rather than MySpace, because they had advanced experience in communicating using Facebook for social purposes (Bullen, Morgan & Qayyum, 2011). Similarly, findings from Gallardo-Echenique's (2014) PhD research study, conducted with university first-year students in Spain, revealed that students were more familiar with Facebook than WhatsApp. As such, they used Facebook to communicate with their lecturers, who also encouraged this practice.

Furthermore, some international studies revealed that student digital literacy practices were stratified by gender. A survey conducted with a stratified sample of undergraduate students at UK universities during the 2006/7 academic year revealed that gender differences were influencing factors for undergraduates' use of the internet (Selwyn, 2008). Another study conducted by Jones et al. (2010) with first-year students based in five universities in the UK, revealed that more male students than female students found the internet useful for finding information and communicating. Another study conducted by Kim, Sin and Tsai (2014) in the United States, to investigate which social media platforms were used as information sources, revealed that male students used blogs, media-sharing sites, social question and answer tools, user reviews and Wikipedia more frequently than female students to find information. Similarly, in a study conducted by Selwyn and Gorard (2016) with undergraduate students enrolled in two Australian universities, more male students were reported to find Wikipedia useful for finding information when compared to female students.

The above literature review demonstrates that there are multiple factors influencing digital literacy practices of digital learners, rather than age and familiarity with technology. The next section describes how students could most likely acquire digital literacy practices in discipline-specific contexts.

2.4 Student acquisition of digital literacy practices

NLSS proponents move from the premise that the dynamic nature of digital technologies and information environments may need people to continually develop their understanding and competence in these areas (Lankshear & Knobel, 2008). This implies that the nature of digital literacy practices evolves over time even within the same context (see Section 2.2.2). It is in this context that Martin argues that "digital literacy is a condition, not a threshold" (2006:20). He emphasises that:

> The assertion of digital literacy for any person or group is always provisional. Digital literacy is an ongoing and dynamic process – it is not a threshold that, once achieved, guarantees familiarity with the digital for ever after. … It is dependent on the needs of the situation; when those needs change, what constitutes digital literacy for that situation may change (*ibid*).

Related to the above, Lankshear and Knobel (2008a) note that digital literacy cannot be acquired: 1) in a linear way, and 2) in the same way by everyone. This NLSS view on acquisition of digital literacy informed my investigation of how students could possibly acquire digital literacies.

Related to acquisition of digital literacies is the work on the pedagogy of multiliteracies. Gee and his colleagues who were part of the New London Group (1996) argued that for practices, such as multiliteracies to be 'mastered', educators need to be designers of the learning process and environment that immerses the community of learners in an authentic version of the respective practice – situated practice. It is in this context that Gillen and Barton (2010) emphasise the importance of the "guidance to learn" element of pedagogy (p.10) in order to foster acquisition and development. In summary, the four components of the pedagogy proposed by the New London Group (1996), emphasise the role of learning within a situated practice, which transforms students to "become active, informed and skilled citizens" (Gillen & Barton, 2010:5) who may apply what has been learned in different contexts of life.

The above discussion implies that a curriculum designed for fostering digital literacy practices must provide authentic contexts for practice. In a teaching and learning context, academics are in the best position to encourage students to author or contribute to digital content creation, as it has been noted elsewhere that:

> . . . the creative knowledge building and sharing, such as the originating of blogs and wikis, tagging, meme-ing, reviewing, recommending, and repurposing, remain minority activities to which most learners are introduced by educators (Selwyn 2009, cited in Littlejohn, Beetham & McGill, 2012:552).

Kennedy et al., (2010) had also suggested that media creation or editing be used for a good cause in the curriculum. They further warned that a large sub-population of the Net Generation students have relatively little experience with many technologies; hence, educators may have to "pay careful attention to providing appropriate support and scaffolding to students when any other than the most basic technology-based learning activities are designed and implemented" (Kennedy et al, 2010:340).

2.5 Chapter summary

Review of the literature on literacy reveals that the social practice approach to literacy recognises the socio-cultural context of a literacy practice. This is the approach adopted in this research study, and the immediate context of digital literacy practices is the students' academic disciplines. Analysis of literature on HE students' digital literacy practices reveals that these practices are influenced by the discipline, LAAs, students' experience in using technology prior to enrolling for university, gender, age and digital technology access at university.

With the above conceptualisation of digital literacy, students are considered digitally literate if they master their discipline's digital literacies. Previous studies on academic literacies and multiliteracies reveal that literacies differ from one discipline (or context) to another. At the same time, research on these literacies suggests that literacies are acquired through learners being immersed in the respective literacy practices. For the current research, the above implies that students acquire digital-content-creation literacies in preparation for digital knowledge production, through immersion in such discipline-specific practices.

The next chapter introduces the ideological and theoretical underpinnings through which my research study is anchored.

Chapter 3: Ideological foundation, and theoretical and analytical frameworks

3.1 Introduction

Drawing on Scribner and Cole's (1981) 'practice account of literacy' perspective, this research study aims to understand how and why first-year higher education students acquire digital-content-creation literacies in discipline-specific settings. In an attempt to achieve this, I studied the students' digital literacy practices, socio-cultural factors, and enablers and contradictions influencing their practices in discipline-specific settings. I further studied the ways in which students acquired digital literacies in these settings. In Chapter 2, I explained how I adopted the ideological model to digital literacy and used Ng's (2015) adapted digital literacy framework to represent the three dimensions of digital literacy practices. In this chapter, I first introduce the meta-theory, critical realism and describe how the critical realist orientation underpins the explanation of potential factors influencing students' digital literacy practices. Secondly, I draw on the literacy research theoretical influence to describe the nature of a digital literacy event and practice. Thirdly, I introduce the Activity theory (AT), a theoretical resource; I explain some AT concepts used in this study and how Engeström's (2001) second-generation AT has been used as an analytical framework for capturing the socio-cultural factors. The socio-cultural research approach to literacy and AT have proved to be complementary in prior studies (Mills, 2010).

3.2 Critical realism

Critical realism (CR) is based on the understanding that "there is a world existing independently of our knowledge of it" (Sayer, 2000:2). That is, critical realism suggests that there exists a reality outside the human mind and beyond our knowledge of, and desires to, change it (Benton & Craib, 2001; Corbetta, 2003). This reality is structured, differentiated, stratified and changing (Danermark et al., 2002), hence, our knowledge about it may be relatively incomplete, probabilistic and fallible. This implies that there is no 'objective' knowledge of reality (Maxwell, 2012a). CR holds that there are multiple perceptions, opinions and beliefs about reality, and methods of acquiring knowledge about reality, but does not recognise the existence of multiple realities. It is in this context that Corbetta (2003) noted that being critical entails questioning every scientific acquisition about reality as we attempt to get to the closest possible knowledge about it. A description of the key elements of critical realism, such as stratification, the transitive and intransitive reality, and emergence and causality is provided in Section 3.2.1-3.2.3.

3.2.1 Stratification of reality

Critical realists (such as Bhaskar, 1998; Sayer, 1992; Benton & Craib, 2001) propose a stratified ontology of reality that is composed of the real, actual and empirical levels. The ‘real’ is the deeper level of reality made up of structures and causal mechanisms that produce events. According to Bhaskar, “things [and humans] have powers and dispositions to act in certain ways in virtue of their intrinsic structures or natures or real essence” (1998:9). When these powers are triggered, they then play out as mechanisms for events (p.9). However, it is noteworthy that these mechanisms exist independently of the events (actual) that they generate (Bhaskar, 1998). That is, the ‘actual’ refers to the observable events which happen if and when mechanisms are activated. These events take place whether or not we experience or notice them. This implies that the ‘empirical’ is the direct or indirect experience of events. This domain of experience happens with or without our knowledge of the actual or real (Sayer, 2000). The real is intransitive while the actual and empirical are transitive.

Bhaskar (1998; 2008) emphasises how the three domains: mechanisms, events and experiences constitute an overlapping representation of reality (Table 3.1).

Table 3.1: Three domains reality (Bhaskar, 1998:41)

	Domain of Real	Domain of Actual	Domain of Empirical
Mechanisms	√		
Events	√	√	
Experiences	√	√	√

Benton and Craib summarise the three domains as follows:

a. the ‘real’ world of mechanisms, power, tendencies and so on, which science seeks to discover (level a);

b. the ‘actual’ level of flows, or sequences of events, which may be produced under experimental condition, or occur in more complex and less predictable ‘conjunctures’ outside the laboratory (level b);
c. the ‘empirical’ level of observed events, which must necessarily be only a small subset of b (2001:125).

The above notion of reality suggests that, methodologically, researchers investigate the “relationships and non-relationships, respectively, between what we experience, what actually happens, and the underlying mechanisms that produce the events in the world” (Danermark et al., 2002:21). The critical realist ontological position is useful in illuminating that reality is not only about what we can observe at the actual and empirical level. For instance, beneath the student digital literacy practices that we can observe, is the abstract level with structures and mechanisms that produce the events (assignment writing or learning and assessment activities in this research) where these digital literacy practices are carried out. The above suggests that studying the surface appearance of phenomena does not help us understand what the causal powers and mechanisms that produce the phenomena are. In the context of the current research, I am interested in finding out why students might create digital content in their courses. Hence, this meant developing an in-depth understanding of the factors influencing students’ digital literacy practices that endeavours to uncover not only the empirical level, but the actual and the real, where possible.

3.2.2 Transitive and intransitive dimensions of knowledge

Bhaskar (1998) noted two dimensions of realism: the transitive epistemological dimension and the intransitive ontological dimension. The transitive dimension, which deals with the production of knowledge about reality, is conceptually mediated, hence it is likely to change (Danermark et al., 2002); whereas the intransitive dimension is less likely to change as it is the underlying structures and mechanisms producing a phenomenon. Bhaskar (1998) makes an example of the formation of water where he says that if two atoms of hydrogen and one atom of oxygen combine, there would be osmosis when the circumstances are favourable. This happens without our scientific discovery or investigation (transitive knowledge). Reducing reality to what we can know about it was termed ‘epistemic fallacy’ (Bhaskar, 1978 cited in Danermark et al., 2002:21). Bhaskar (1998) emphasises in his notion of ‘epistemic fallacy' that the intransitive dimension exists independently of its discovery and cannot be reduced to patterns of observable events and experiences that it generates. That is, causal laws deduced from the empirical investigations (as a result of using various theories) cannot be deemed sufficient for explaining the underlying structures and generative mechanisms for events (Bhaskar, 1998). This suggests that people may use different evolving theories in an attempt to understand reality, but these theories can only give us a relative understanding of what reality is. As Danermark et al. (2002) write, methodologically, "The kind of knowledge that is produced depends on what problems we have and what questions we ask in relation to the world around us" (p.26). That is, knowledge has different meaning to people with different practices developing or using the knowledge (Danermark et al., 2002). It is in this context that Sayer (2000) also emphasises that even when theories change (the transitive dimension), that does not mean that the 'real' (the intransitive dimension) would necessarily change.

3.2.3 Emergence and causation

Emergence is another central concept to CR. Emergence refers to "situations in which the conjunction of two or more features or aspects give rise to new phenomena, which have properties which are irreducible to those of their constituents" (Sayer 2000:12). That is, there may be a combination of two or more underlying mechanisms or set of conditions that may not have the same influence on a phenomenon as either of them would have. By implication, a combination of conditions makes it more difficult to anticipate the outcome as compared to when there is one condition (Danermark et al., 2002). In the context of the current research, students' digital literacy practices may be influenced by one or more personal and socio-cultural factors, such as students' socio-cultural histories, their prior experience of using ICT and the disciplines in which they enrol at university. Contributing to the complexity of emergence is the differentiation of the world. Real world situations operate in open systems rather than closed ones, hence, there is no guarantee that the influencing conditions remain constant (Bhaskar, 2008). For instance, conditions may change within contexts or over time.

Another feature of realism is its analysis of causation which rejects reduction made from regularities among sequences of events (Sayer, 2000). As noted above, the realist perspective posits that causality concerns mechanisms rather than causes. Accordingly, we cannot merely determine causal mechanisms underlying events and actions by “accurately identif[ying] causes in a theory-natural way” (Maxwell, 2012: 656), as in a cause-effect relationship. Also, Sayer (1992) argues that, in addition to mechanisms, human actions are influenced by enabling conditions (such as tools, other actions, reasons, beliefs) and material circumstances in the humans’ social contexts.

The above implies that “events arise from the workings of mechanisms which derive from the structures of objects, and they take place in geo-historical contexts” (Sayer, 2000:15), which also generate the influencing conditions, as illustrated in Figure 3.1 below.

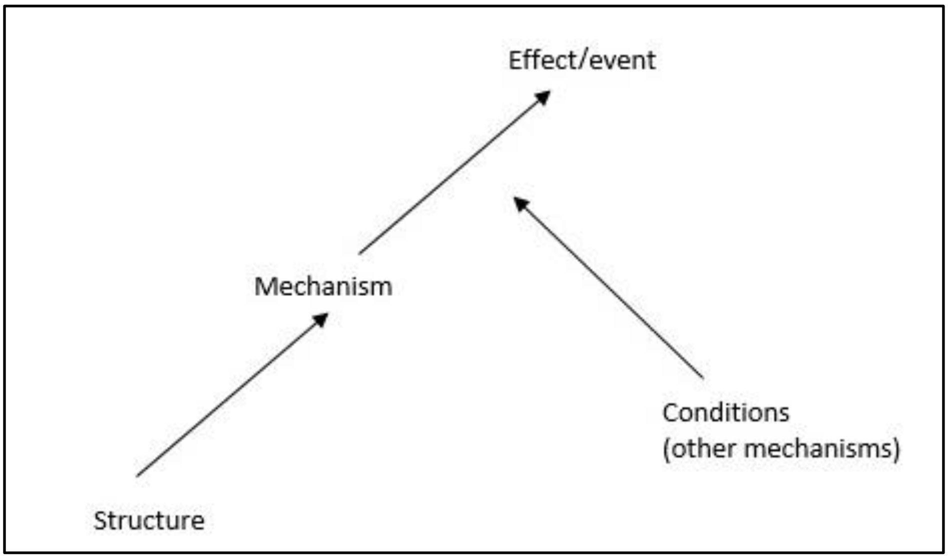

Figure 3.1: Critical realist view of causation (Sayer, 2000:15)

However, the resulting human context-dependent actions do not necessarily stand in fixed relations to the circumstances. This could also be partly because people are agents who in their own right have their own intentions for actions and, at the same time, reproduce or transform social structures (Danermark et al., 2002). That is, people may have their agency or volition motivating their actions. In an attempt to address this causal complexity, critical realists suggest the value of a qualitative inquiry that considers the context, circumstances that lead to a particular event, causes, enabling and constraining conditions for actions, and the process of understanding how one thing influences another (Sayer, 1992; Danermark et al., 2002; Maxwell, 2012). In the current research, I used qualitative methodologies to determine the socio-cultural factors, enabling and constraining conditions, and students’ driving forces (motivational factors) for their digital literacy practices.

In addition to the above causal complexity, Danermark et al. note that "A particular mechanism can produce completely different actions at different times, and inversely the same event can have completely different causes" (2002:58). This is a characteristic of the transitive knowledge. Hence, I am aware that the empirical research element in this research captures a moment in time of the students' digital literacy practices and influencing factors.

In short, the critical realist approach is adopted in this research study because:

> Critical realism provides an alternative to several philosophical and methodological positions which have been found wanting. … By simultaneously challenging common conceptions of both natural and social science, particularly as regards causation, critical realism proposes a way of combining a modified naturalism with a recognition of the necessity of interpretive understanding of meaning of social life (2000:2-3).

This implies that critical realism supports the notion of 'moderate essentialism' rather than a 'strong essentialism' between an event and its underlying mechanisms (Trowler, 2014). A strength of critical realism is that in addition to induction, deduction and abduction, it utilises retroduction (Danermark et al., 2002). Retroduction is a "… mode of inference in which events are explained by postulating (and identifying) mechanisms which are capable of producing them …" (Sayer, 1992:107). That is, it is an epistemological process that moves from the concrete (events and empirical experiences) to the abstract (the domain of structures and mechanisms) in an attempt to explain what caused the concrete to occur or things to be the way they are (Danermark et al., 2002; Easton, 2010). In the current research study, I drew on the critical realism' causal mechanisms notion in an endeavour to explain: 1) why students were carrying out the digital literacy practices in the way in which they did, and 2) why acquisition of digital literacies was taking place in the discipline-specific settings. Critical realism also utilises the other three modes of inference such as induction, deduction and abduction (Danermark et al., 2002). These modes are explained in Section 4.9. The next sections focus on the theoretical stance of literacy and contributors to a literacy practice.

3.3 Digital literacy events and practices

Literacy researchers (such as Street, 2001; Barton & Hamilton, 2005) note that, within a particular context, there needs to be a literacy event that serves as the unit of analysis. According to Bhatt (2014), literacy events "yield snapshots of the social and cultural order in which literacy activities are institutionally and organisationally mediated" (p. 68). In his PhD research study, Bhatt (2014) argued for the concept of ‘digital literacy events’ to represent literacy events that are digitally saturated. Drawing on Lankshear and Knobel’s (2008a) definition of digital literacy, Bhatt posits that digital literacy events are “observable occasions in which digital text is central and where meanings are mediated by texts that are produced, received, distributed, exchanged, etc., via digital codification and digital enculturation” (Bhatt, 2014:68-69). This implies that digital literacy events are multimodal (Bhatt, 2014). Additionally, for Bhatt (2014), digital literacy events based in teaching and learning environments are shaped by multiple contexts, such as the classroom, everyday activities, learning institutions and global trends. These are also dynamic in nature (Barton & Hamilton, 2005; Lankshear and Knobel, 2008a). It follows that digital literacy practices are socially and culturally recognised, have a historical point and are constantly evolving (Barton & Hamilton, 2005; Gee, 2010). The above discussion, thus, informs the research methodology of this research (See Chapter 4). For this research, the immediate contexts are the students’ courses within disciplines and the digital literacy event is assignment writing, which instantiates its associated activities and practices.

3.4 Researching digital literacy practices

In her book *‘Literacy Theories for the Digital Age: social, critical, multimodal, spatial, material and sensory lenses’*, Mills (2016) reviewed 10 years’ worth of research as part of the ‘digital turn’ within literacy studies. She covers a wide range of research in the field and suggests that researchers can select from “rhizomatic confluences of literacy theories” (p. xix), such as socio-cultural, socio-spatial and socio-material theories, critical pedagogy, theories of multimodality and social semiotic tradition, to interpret literacy practices as they occur in political, cultural, historical and technological contexts (*ibid*). Mills (2016) outlines the conceptualisation of these theories and how they overlap with one another. The current research draws on the socio-cultural research approach to literacy, which contends that “literacies carry meaning primarily through their entanglement with cultural values” (Mills, 2016:20) and the Cultural Historical Activity Theory (CHAT), which enables the study of activity and practice, individual actions and collective activities, and artefacts (which are constituents of culture – described below) (Mills, 2016). According to Mills (2016), CHAT allows researchers to study “the unseen people and things that have been built up around the individual, such as rules and norms, …[that] influence the social world and literacy practices” (p.121), as well as the role of evolving technologies in shaping the literacy practice (*ibid*). She posits that researchers have, for instance, blended these theoretical resources to study the intertwined relationship between literacy practices, artefacts and contexts (Mills, 2016:129). Below is a description of how CHAT or AT is used in this research to identify the possible socio-cultural, enabling and constraining factors influencing students' digital literacy practices within the respective digital literacy events.

3.4.1 Activity theory (AT)

In this research I use AT as the epistemological framework for eliciting the socio-cultural factors influencing students' digital literacy practices within their courses. I use Engeström's (2001) 2nd generation of AT as an analytical tool for the qualitative data to understand the "complex [student] learning situations that can be observed in natural setting" (Yamagata-Lynch, 2010:23). I argue for the use of AT because it has some relations to practices. Firstly, Scribner and Cole (1981) conceptualise a practice as a recurrent, goal-directed sequence of activities mediated by mediating artefacts. Secondly, AT is useful in this study because it captures both individual actions and collective activities carried out by students within an activity system. It is also helpful in this study as Gee (2010) highlights that activity systems, among others, are useful for studying literacy because they foster ways in which people "socio-culturally organize themselves to engage in [literacy] activities" (p.21).

Literacy studies' researchers (such as Keating, 2005) have noted how the insights of AT have been useful for studying literacy practices. AT also helps researchers study the socio-cultural context of activities (practice) and pays attention to issues of historicity and how they impact on the practice being studied. Additionally, the AT analysis complements the digital literacy framework which only captures the practices in the technical, cognitive and social-emotional dimensions, but cannot explain the contextual aspects influencing student practices.

3.4.1.1 Mediated action

The conceptualisation of AT originated in Russia and was heavily influenced by Marx's theory of society (known as historical materialism) (Vygotsky, 1978). According to Vygotsky (1978), Marx's work attempted to provide a dialectical materialist view of human action. That is, according to Marx, "historical changes in society and material life produce changes in ‘human nature’ (consciousness and behaviour)” (Vygotsky, 1978:7). Vygotsky (1978) also posits that Marx’s work was further developed by Engels who elaborated on the notion of human labour and tool use where he claimed that human beings are transformed as a result of the means by which they transform nature. That is, for Engels, “the specialization of the hand - this implies the *tool*, and the tool implies specific human activity, the transforming reaction of man on nature” (Vygotsky, 1978:7).

Vygotsky further developed Marx’s perspective, in his work: *“Mind in Society: The Development of Higher Psychological Processes”,* to include the psychological element (mind) of human beings in their behaviour. In contrast to behaviourists’ work, such as Pavlov’s study of conditioned reflexes, that assumed that human beings and animals acted in the same manner, where their actions were a response to a stimulus (stimulus-response bond), Vygotsky (1978) emphasised the role of the human mind in any human action. Vygotsky (1978) argued that humans (subjects) do not just react to certain conditions (stimuli) as animals do, but respond in a psychological manner. Drawing on Engels’ notion of human labour and tool use, Vygotsky (1978) further argued that when human beings interact with the environment, they transform it and at the same time, the humans’ higher psychological functions are developed. This became the emphasis of Vygotsky’s socio-cultural theory of higher cognitive functions (1978:6).

Drawing on the above notion of mediated human-environment interaction, Vygotsky further developed the idea of the use of tools and sign systems (such as language, writing, number systems) for mediating human actions. In his work, which focuses on human behaviour and the societal context in which the behaviour is developed, he emphasises the social and cultural origin of the human mind, which in turn influences human behaviour. Hence, for Vygotsky, humans develop tools “over the course of human history and [these tools] change with the form of society and the level of its cultural development” (Vygotsky, 1978:7). That is, when a stimulus (S) triggers human behaviour (response - R), the individual draws cultural tools (X) “to actively modif[y] the stimulus situation as part of the process of responding to it” (Vygotsky, 1978:14). The entire structure of this activity which produces the behaviour is what he termed ‘mediating’ (p.14).

Engeström summarised the key activities as follows:

> The insertion of cultural artifacts into human actions was revolutionary in that the basic unit of analysis now overcame the split between the Cartesian individual and the untouchable societal structure. The individual could no longer be understood without his or her cultural means; and the society could no longer be understood without the agency of individuals who use and produce artifacts. … Objects became cultural entities and the object-orientedness of action became the key to understanding human psyche (2001:34).

The mediated act, as described by both Vygotsky and Engeström is represented in Figure 3:2.

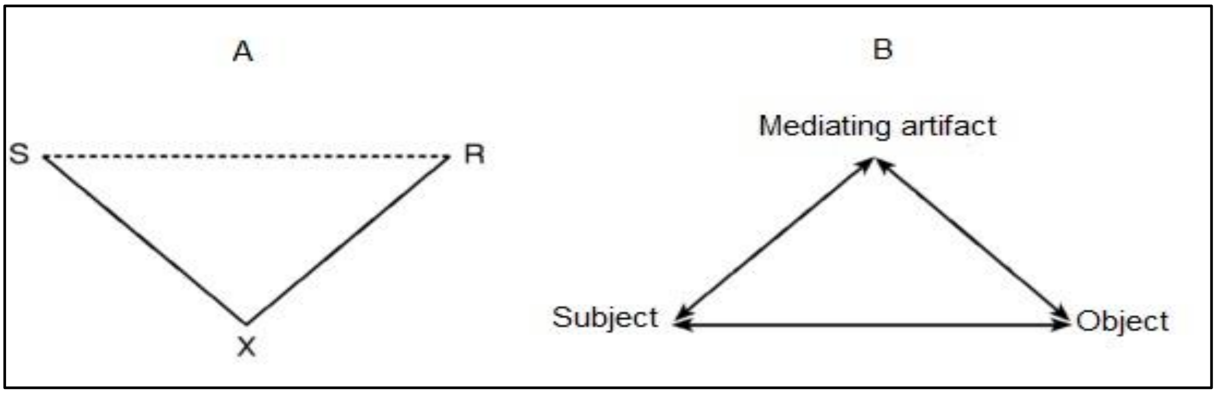

Figure 3.2: (A) Vygotsky's model of mediated act and (B) its common reformulation (adopted from Engeström, 2001:134)

The above implies that, since human activities are mediated by cultural tools, then the human behaviour develops over the course of human history; meaning that "the mechanism of individual developmental change, is rooted in society and culture" (Vygotsky, 1978:7). In simple terms this implies that an "individual acts upon and is acted upon by social, cultural and historical factors in the course of ongoing human activity" (Daniels, 2008:4). Vygotsky's work gave rise to the socio-cultural perspective that "overcomes the divide between, on the one hand, human mind, and on the other hand, culture and society" (Kaptelenin, 2013:2). That is, the "social nature of human mind and inseparability of human mind and activity" *(ibid*).

Although Leontiev (1978) never graphically expanded Vygotsky's model of mediated act into a model of a collective activity system (Engeström, 2001), he moved the conceptualisation of an internal (individual/subject focused) and external (individual and community) activity, forward. Engeström (2001) reformulated Leontiev's representation of a collective activity into a triangle. Drawing on Vygotsky's (1978) focus (subject's interaction with the object being mediated by tools), as illustrated in Figure 3.1 above, Engeström represented an object with an oval shape to indicate that “object-oriented actions are always, explicitly or implicitly, characterised by ambiguity, surprise, interpretation, sense making, and potential for change” (2001:134). He also added an inverted triangle to make explicit that individuals (subjects) who are engaged in a collective activity, together make up a community, and this community divides the labour (splits functions) between participants, who all work towards a common object.

In the three-way interaction between ‘subject’, ‘object’, and ‘community’, the interaction between the subject and object are mediated by tools and signs; interaction between the subject and community are coordinated by rules, and between the object and community, interactions are facilitated by the division of labour among participants (Engeström in Kaptelinin, 2013). In simple terms, all the elements of an activity system are related in one way or another, and may directly or indirectly influence each other, as illustrated by the two-headed arrows. It is also important to note that Engeström (2001) referred to Vygotsky’s triangle as the 1st generation activity system, and his as the 2nd generation activity system.

Figure 3.3 illustrates how Engeström (2001) reformulated the second generation of an activity system.

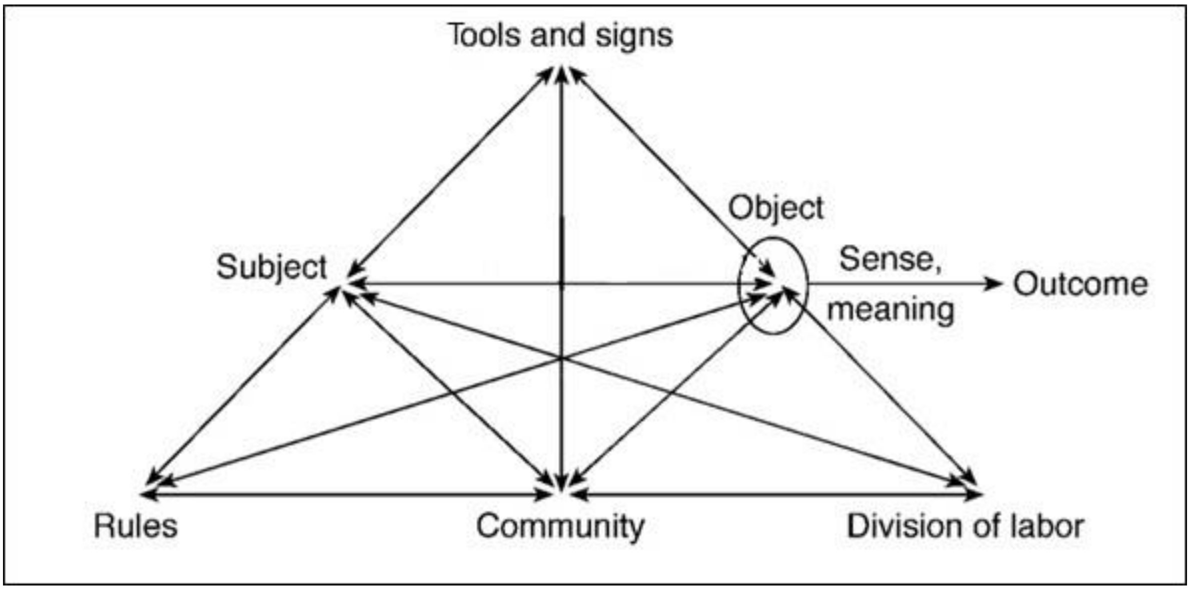

Figure 3.3: The structure of a human activity system (adopted from Engeström, 2001:135)

Following Engeström (2001), the elements of an activity system include a subject, an object, an outcome, tools, a community, division of labour and rules (Table 3.2 below).

Table 3.2: Elements of an activity system

Elements of activity	Explanation of the element
Subject	An individual or a group of people engaged in an activity. That is, an individual or a group of people "whose agency is chosen as a point of view in the analysis of the activity system" (Mukute, 2010:91).
Object	Raw material or problem space being worked on. It is "characterized by ambiguity, surprise, interpretation, sense making, and potential for change" (Engeström, 2001:134). An object can be material or conceptual and "the object represents the intention that motivates the activity" (Jonassen & Rohrer-Murphy, 1999). It is "what connects individual actions to the collective activity" (Engeström, 1999b:31).
Outcome	Desired result of working on the object. That is, the product of an activity.
Tools	Could be external, material (for example, a textbook, a digital device, software), internal, symbolic (for example, language, software conventions, models or heuristics) tools or another person (s) in the social system that take(s) part in the transformation of an object into an outcome (Basharina, 2007; Murphy & Rodriguez-Manzanares, 2008). "These tools carry culture, history, skill and knowledge involved in developing and using them" (Mukute, 2010:91). They can "enable or constrain an activity" (Murphy & Rodriguez-Manzanares, 2008:443). Hence, the use of tools in an activity is more likely to shape the way people act and think (Jonassen & Rohrer-Murphy, 1999).
Community	Group of people who share the same object. A community is a social mediator of an activity (Engeström, 1999a).
Division of labour	"Horizontal and vertical allocation of responsibility which mediates relationship between the community and the object" (Mukute, 2010:91). Division of labour also involves "the division of tasks and roles among members of the community and division of power and status (Rodriguez-Manzanares, 2012:22).
Rules	These mediate "the interaction between the subject and the community, as well as between the subject and the object" (Mukute, 2010:91).

Sources: Engeström (1999a; 1999b; 2001); Basharina (2007); Murphy and Rodriguez-Manzanares (2008); Jonassen and Rohrer-Murphy (1999); (Mukute, 2010)

The strength of using AT in an educational context is that it allows students to be viewed as part of an education system rather than as individuals (Rodriguez-Manzanares, 2012).

3.4.1.2 Historicity in activity theory

One of the strengths of AT is its principle of historical analysis of the individual and the systems under investigation. Engeström (2001) notes that individuals, who are participants in an activity, carry their own diverse histories, while an activity system itself also "carries multiple layers and strands of history engraved in its artefacts, rules and conventions" (p.136). From a research perspective, (Engeström, 1999b) emphasises that researchers must work with manageable-sized units of analysis that acknowledge both the individual biographs (ontogeny) and social processes of change (morphogenesis), such as identifying the past cycles of the activity system. He emphasises that:

> If the unit is the individual or the individually constructed situation, history is reduced to ontogeny or biography. If the unit is the culture or the society, history becomes very general or endlessly complex. If a collective activity system is taken as the unit, history may become manageable, and yet it steps beyond the confines of individual biography" (Engeström, 1999b:26).

The above suggests that, for individuals, their socio-cultural histories in relation to the activity system under investigation is important. For instance, some researchers note that in an educational context where learning is mediated by technology, students' technology experience (Rodriguez-Manzanares, 2012) and students' prior cultures-of-use (Thorne, 2003; Basharina, 2007) can be understood by studying student histories of using technology such as computers and the internet for learning. In the current study, students' socio-cultural histories, in relation to their high school and university digital literacy practices, are studied.

With respect to the activity system, Engeström (2001) emphasises that "activity systems take shape and get transformed over lengthy periods of time" (p.136). Some "remains of older phases of activities stay often embedded in [the activity systems] as they develop" (Kuutti, 1995:26). It is therefore important to understand the history of an activity where "history itself needs to be studied as local history of the activity and its objects, and as history of the theoretical ideas and tools that have shaped the activity" (Engeström, 2001:136). In the current study, the historical culture of the student learning activity systems is studied.

Methodologically, Engeström advises that historical analysis can be done through periodisation, where one “divides the stream of historical events into larger patterns that have meaningful characteristics of their own” (1999b:32); that is, morphogenetic cycles. This conceptualisation resonates with his notion of an expansive cycle that he uses to understand the emergence of a new social structure on the basis of a preceding one (Engeström, 1999b). Transforming the old activity system may require a reflective analysis of the internal contradictions to inform the development of culturally advanced models, artefacts and practices (Engeström, 1999b). Literacies researchers note that people are active agents in a literacy event who make decisions about their practices.

3.4.1.3 Volitional acts in activity systems

Leontiev (2005) describes volitional acts as deliberate and voluntary actions that serve a rational and essential goal. This implies that volitional acts are carried out by choice (Leontiev, 2005). However, Leontiev (2005) and Sannino (2015) emphasise that while ‘voluntary’ refers to the possibility of deliberate choice, ‘choice’ in a volitional act is based on decision-making.

This means that volition involves the formation of motives and the making of decisions by an individual (Sannino, 2015). Another feature of volitional actions is ‘will’. Leontiev emphasises that “will is there – and it is only present – when a goal-serving action takes place under conditions of choice between two possible or many possible actions” (2005:78). In this context, the term ‘volitional’ has the connotation of “strong will demonstrated by overcoming obstacles” (Sannino, 2015:6). That is, as Leontiev puts it: “If an action is carried out without obstacles, it cannot be volitional, even if there is a choice and a decision is made” (2005:80). This means that a volitional action includes will, deliberate choices, decision-making, irrespective of foreseen obstacles. In the context of the current research study, students may decide to engage in a digital literacy practice even if they may still have to acquire skills to do so, implying that volitional action may be associated with a deliberate choice.

3.4.1.4 Contradictions

Engeström notes that "activities are open systems" (2001:137) so, "when an activity system adopts a new element from the outside (for example, a new technology or a new object), it often leads to an aggravated secondary contradiction where some old element (for example, the rules or the division of labor) collides with the new one" (*ibid*). Kuutti asserts that contradiction indicates a "[misfit] within elements, between them, between different activities or different development phases of a same activity" (1995:34). According to Engeström, contradictions are "historically accumulating structural tensions within and between activity systems" (2001:137). Due to this historial nature, Engeström and Sannino emphasise that contradictions "must be traced in their real historical development" (2011:371).

Kaptelinin summarises the four categories of contradictions as:

- Primary contradictions are inner contradictions of each of the nodes of an activity system.
- Secondary contradictions are those that arise between the nodes of an activity system.
- Tertiary contradictions describe potential problems emerging in the relationship between the existing forms of an activity system and its potential, more advanced object and outcome. The advancement of an activity system as a whole may be undermined by the resistance to change, demonstrated by the existing organisation of the activity system. For instance, in a learning context, CHAT can help illuminate "challenges related to cultures of use of tools occurring when students approach a new task with old habits" (Murphy & Rodriguez-Manzanares, 2008:444).
- Quaternary contradictions refer to contradictions within a network of activity systems, that is, between an activity system and other activity systems involved in the production of a joint outcome (Kaptelinin, 2013:13).

Figure 3.4 illustrates the potential four levels of contradictions in the current research. The numbers 1, 2, 3 and 4 represent the respective levels of contradiction.

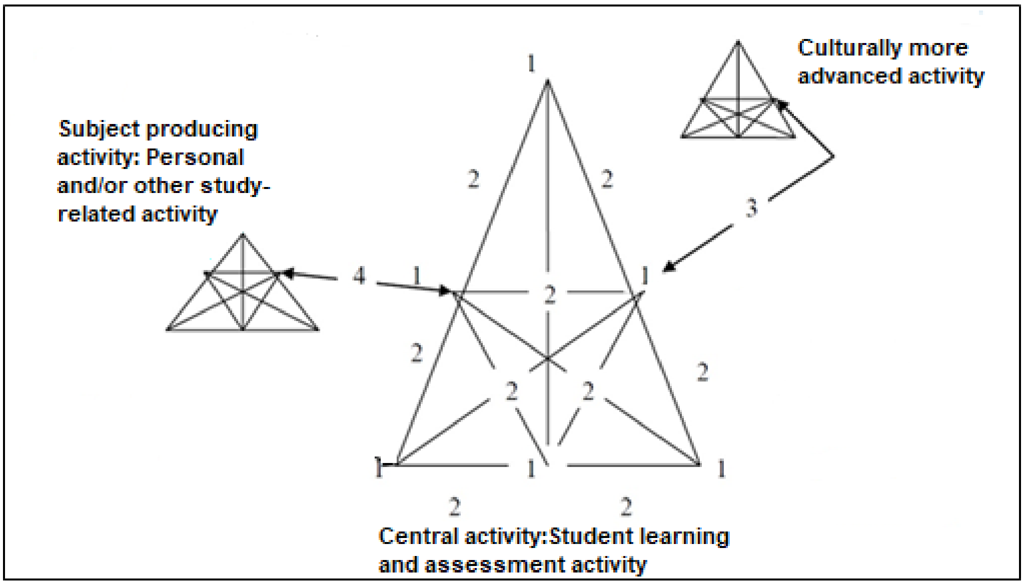

Figure 3.4: Third generation activity system and four levels of contradiction (Adapted from Mukute, 2010:104)

In the context of this research, I am aware that primary contradictions may emanate within the same node, for instance, when a group of students (subject) with different digital experiences work together. There may also be secondary contradictions resulting from a collision of two nodes, for instance, when a new technology is introduced into the student learning system. Collaboration tools drawn into the student activity system, as mediating tools and collaborating on shared tasks (the object), are unfamiliar encounters for the students, which may result in disruptions to their digital practices. Since an object is constantly evolving in nature, there may be tertiary contradictions between the initial activity and a more advanced one (for example, pedagogical implications for designing learning activities when technology is introduced into a student learning system). There may also be quaternary contradictions between elements of the student learning system and the activity systems producing the respective elements. However, Engeström (2001) argues that contradictions serve as fertile ground for innovation. This suggests that those involved need to interpret and negotiate new meaning of the situation (Engeström & Sannino, 2011). That is, in the context of this research, findings will hopefully illuminate ways in which lecturers could potentially adapt learning and assessment activities (LAAs) to enhance students' digital content creation. The next section describes a theoretical underpinning to how students could acquire digital literacy practices.

3.5 Student acquisition of digital literacies

The current research draws on Gee's (1990; 2008) model for literacy and discourse acquisition to describe how students are acquiring discipline-related digital literacies. Gee moves from the same premise as Lave and Wenger (1991) and Wenger (1998) who argue that learning takes place through participation in situated social and cultural practices. Additionally, Gee asserts that "acquisition of literacy requires exposure to models in natural, meaningful and functional setting" (2008:177). He makes a clear distinction between acquisition and learning, as he describes below:

> Acquisition is a process of acquiring something subconsciously by exposure to models, a process of trial and error, and practice within social groups, without formal teaching. It happens in natural settings which are meaningful and functional in the sense that acquirers know that they need to acquire the thing they are exposed to in order to function and they in fact want to so function. … Learning is a process that involves conscious knowledge gained through teaching (though not necessarily from someone officially designated a teacher) or through certain life-experiences that trigger conscious reflection (Gee, 1990:169-170).

Gee further emphasises that in some cases, acquisition and learning can be combined in the developmental process, where learning could be facilitated through overt instruction and other skills acquired in the process. Gee argues that "we are better at performing what we acquired, but we consciously know more about what we have learnt" (2008:170). He provides examples of learning to drive a car, playing a musical instrument, dancing, using a second language. It is on the basis of the above descriptions that Gee (2008) asserts that secondary discourses are mastered through acquisition, resulting from enculturation (apprenticeship) into social practices, trial and error, practice within social groups, and scaffolded and supported interaction with people who have already mastered the Discourse, rather than overt instruction in formal teaching settings. This implies that "if you have no access to the social practice, you don't get in the Discourse, you don't have it" (Gee, 1990: 147). The current research therefore, draws on this description of acquisition, to determine student acquisition of digital literacy practices.

Similarly, Gee (1990) noted that in apprenticing to new social practices, a learner also acquires a new identity (p.67). In the context of this research study, the above illuminates that students' digital identity may emerge as a result of participating in, and/or, sometimes, acquiring digital literacy practices in their courses. At the same time, these nascent digital identities may at some point connect or contradict the students' existing digital identity (Gee, 1990). However, researching the development of students' digital identity as they participate in discipline-specific practices is beyond the scope of the current research.

3.6 Chapter summary

This chapter describes how the critical realist orientation underpins the explanation of potential factors influencing students' digital literacy. The chapter also discusses the ideology of a social practice together with the theoretical resources used to analyse data and explain the findings of this research study. The final part of the chapter discusses the theoretical underpinning of digital literacies acquisition. The following chapter describes the research design and methodology adopted in this study.

Chapter 4: Research design and methodology

4.1 Introduction

This research attempts to understand how and why students acquire digital content-creation literacies within discipline-specific settings. It also investigates the course contexts to surface possible influencing factors, and enabling and constraining factors for student digital literacy practices. Ng's (2015) edited conceptual framework is used as an analytical framework for data from the questionnaire and to categorise student digital literacy practices. Furthermore, I complement the digital literacy practices' framework with the second-generation Activity theory (AT), to analyse data from the focus groups/interviews and students' assignments, in an attempt to tease out the individual factors and socio-cultural aspects of the course context (which is critically important in understanding social practices). The digital literacy practices framework and the triads of the activity system, together, provide the situatedness of digital literacy practices within a digital literacy event (see Section 4.8). I piloted the use of AT to investigate the socio-cultural factors influencing student digital literacy practices in 2015 (see Section 4.6). Furthermore, Gee's (2008) principles of literacy and Discourse acquisition inform the analysis of student acquisition of digital literacy practices. This chapter provides a description of the design approach adopted in this study, the data collection sites and methods used, the pilot study, data analysis methods, validity and ethical considerations.

4.2 Research objectives and question

The objective of this study is to establish how higher education students acquire digital content-creation literacies in a discipline-specific setting.

Research question

How and why do first-year higher education students acquire digital content-creation literacies in a discipline-specific setting?

Sub-questions

The following sub-questions have guided the study:

1. What are first-year HE students' digital literacy practices in their discipline-specific settings?
2. What are the personal and socio-cultural factors that influence students' digital literacy practices, in general, and digital content creation in particular?
3. What are the enablers or contradictions influencing students' digital literacy practices, in general, and digital content creation in particular?
4. In what ways do first-year HE students acquire digital content-creation literacies in their discipline-specific settings?

4.3 The case study design

I used a case study design approach as case studies are deemed ideal for responding to explanatory questions such as 'how' and 'why' in "an empirical inquiry that investigates a contemporary phenomenon within its real-life context" (Yin, 2003:13). From a critical realist perspective, which is underpinned by the notion of stratified reality, case research enables researchers to investigate the causal relations (necessary and contingent) between entities, as well as, the contextually-contingent ways in which structures, power and liabilities of entities may influence what is often observed at the actual and empirical level (Easton, 2010). In the context of this research study, there is a necessary relation between a course and discipline whereas there is a contingent relation between a course and its learning and assessment activities thereof, and students' high school ICT experiences. With regard to the contingent relation, students' high school ICT experiences are only useful if they are transferrable across the high school and university context.

In this research study, I implemented a multiple-case design of two courses that are based in two disciplines. Yin (2003) notes that a question that arises with regard to cases being studied is whether the cases chosen are deemed necessary or sufficient for a study. In response to this question, firstly, I chose the two courses because they are both Academic Development Programme (ADP) courses offered to students in an extended degree programme. The lecturers of these courses have embedded digital literacies in their curricula, hence these seemed to be appropriate cases to investigate and establish students' digital literacy practices.

Secondly, drawing on Gee's social practice notion, the diverse nature of the disciplines in which these courses reside seemed to offer fertile ground for the situatedness of digital literacy practices. Thus, the two courses seemed sufficiently rich for illuminating some individual and socio-cultural factors that may influence first-year higher education students' digital literacy practices, and how they may acquire digital content-creation literacies in these two different settings.

Methodologically, a case research is "a research method that involves investigating one or a small number of social entities or situations about which data are collected using multiple sources of data and developing a holistic description through an iterative research process" (2010:119). This is in line with critical realism (CR) which is a generative theory that focuses on the context, qualitative processes, activities and relations, rather than statistics of particular characteristics (Sayer,1992; Maxwell, 2012). Yin (2009) notes that a critique of the case study approach is that case study findings cannot be generalised. However, he debunks this critique by emphasising that case study research is better positioned to contribute to the expansion of theory, which in turn can help researchers understand or grasp similar cases or phenomena. According to Easton, in a critical realist framing, "expansion and generalisation come from identifying the deep processes at work under contingent conditions via particular mechanisms" (2010: 126).

The critical realist case method suggests five steps:

1) Deciding on the phenomenon to be studied - First-year higher education students digital literacy practices and particularly, their acquisition of digital-content-creation literacies;
2) Identifying the entities/objects that characterise the phenomena being studied - Entities are the course, discipline, student, lecturer

   Event – assignment writing (learning and assessment activity). There are mechanisms that cause the event to occur. These mechanisms are reinforced by structures such as nature of the course and discipline; the relational power between lecturers and students; and students' high school experiences may be an enabler for their volition or be a susceptibility to their digital literacy practices.
3) Collecting data - Questionnaire, focus groups/interviews, assignments;
4) Interpretation of findings in relation to the empirical, actual and real levels of reality;

5) Seeking an explanation - This research study used the deductive, inductive, abductive and retroductive modes of inference to analyse data in each case as well as across the two cases. Below is a detailed description of each case.

Case 1

The Commerce course is offered to students in an extended degree programme in the Commerce Faculty. According to the course site hosted on the university learning management system (LMS), Vula, the course was mapped according to weeks. Each week is comprised of theoretical topics that are taught in class, and tutorial and practical sessions that take place in the computer laboratory. These laboratory sessions are on spreadsheets and data manipulation in Microsoft Excel, as well as, programming. There is not much known about students' access and use of mobile devices[15] in this course. In terms of digital literacy, students are required to use LinkedIn Learning (formally known as Lynda.com) in support of their computer skills throughout the semester. They also complete computer and programming competency tests during week one. Other aspects of digital literacy such as information literacy, including licensing of resources in ways that are alternative to full copyright, such as Creative Commons (CC), are overtly taught. In week seven, students are given the learning and assessment activity that requires them to collaboratively develop a business concept document (Appendix C). For this research study, the collaborative development of a business concept document served as the digital literacy event, which instantiated students' digital literacy practices (solicited through focus groups/interview and the concept document).

Case 2

The Humanities course is offered to students in an extended degree programme in the Humanities Faculty. This course site is also mapped according to weeks. Each week, students are taught theoretical topics in class and also have one lecturer-guided session that takes place in the computer laboratory. In this session, students work through their weekly topic-related activities that involve the use and analysis of multimodal texts. Thereafter, students are allowed to complete these activities at their own time and from anywhere. Most of the

[15] According to Mayisela (2013), mobile devices are hand-held devices such as ipads, tablets and smartphones.

students enrolled for this course had personal mobile devices[16] (PMDs) – loosely refers to mobile devices that students owned and could personalise (including downloading applications of their own choice to support their studies). At the beginning of the 2016 academic year, a short device survey was conducted with these first-year students to identify those who did not have PMDs suitable for learning purposes. Subsequently, 70 students received tablet computers to use throughout their entire study period (that is, students were not required to return the tablets).

For the weekly activities, lecturers post online short-answer type of questions that are based on the videos they provide, together with other materials taught in class (found in the course reader). These lecturers use interactive video software that allows them to elicit student responses, and so they subsequently provide feedback to students. The lecturers further build the three essays on these activities. Essay construction, including paraphrasing, development of arguments and use of the Harvard referencing style, is overtly taught in the course. Students use the resources in the course reader and course site, but are also allowed to find their own online resources for completing their assignments. They use word processing software, Microsoft Word for these activities. For this research study, assignment writing (see example in Appendix C) served as the digital literacy event, which instantiated students' digital literacy practices ssolicited through focus groups/interview and assignments).

For both cases, I undertook class and laboratory session observations. These observations were not formally captured as the purpose was merely get some insights into the context of the two courses.

4.4 Sites and participants

The research data was collected in the two first-year ADP courses that are convened and facilitated by lecturers who endeavour to integrate digital literacies into their curricula, as described above. This is their attempt to foster discipline-related digital literacy practices and the development of digital literacy among students. Thus, I undertook both purposive and convenience sampling. Sstudents enrolled in these two courses were purposefully studied because I had an expectation that they were engaging in digital literacy practices. A strength

[16] http://www.cilt.uct.ac.za/personal-mobile-device-project

of purposive sampling is that a researcher is able to 'handpick' those potential participants who may possess specific characteristics (Cohen, Manion & Morrison, 2007). According to Maxwell, purposive sampling is appropriate when "particular settings, persons, or events are deliberately selected for the important information they can provide that cannot be gotten as well from other choices" (2008:235). A shortcoming of purposive sampling is that the sample may not be representative and the participants' responses may not be generalisable (Cohen, Manion & Morrison, 2007). However, this type of sampling is compatible with the nature and purpose of the current study. Sayer (1992) actually recommends that case studies that have adopted a critical realist approach can study fewer than ten participants. In the current research study, in the respective order of Case 1 (Commerce course) and Case 2 (Humanities course), there were 39 and 64 students who completed the questionnaire, 11 and 16 students who participated in the focus group/interviews (three focus groups and one interview, each), and their respective assignments.

In terms of convenience sampling, access to these two courses was reasonably easy. In my role as a digital literacy coordinator, I am aware of the digital literacy activities in the faculties. I identified lecturers who are integrating digital literacy into the curriculum rather than those who have other people teaching digital literacy as a stand-alone course. Similar to purposive sampling, Cohen, Manion and Morrison (2007) also note that findings of this strategy cannot be generalisable. However, these findings will hopefully provide insight to ways of developing students digital literacies withing their course and disciplinary contexts.

4.5 Mixed-methods approach

This research adopts a mixed-methods approach that uses both quantitative (the questionnaire) and qualitative (focus groups/interviews and students' assignments) methods. Mixed-methods research involves the process of collecting, analysing and interpreting qualitative and quantitative data within a study in order to understand a research problem more completely (Creswell & Plano Clark, 2007). The complexity, transferability and fluidity of students' digital literacy practices across high school, and between personal and academic contexts, while studying at university, made it essential for me to determine their practices using different methods. A strength of the mixed methods approach is that it offsets the weaknesses of either approach (Creswell, 2014). For instance, the quantitative method has a weakness of understanding participants' context and settings, which was balanced by using a qualitative method. Also, where particular findings were emerging in the qualitative data, I could check against the larger set of quantitative data. Another benefit of the mixed methods approach is the ability to triangulate data. I used students' assignments as a means of triangulating student responses in the focus groups and interviews. The above implies that the quantitative and qualitative data in this study are of equal importance.

I adopted a convergent parallel mixed methods design (Creswell, 2014) where I collected the quantitative and qualitative data at about the same time, analysed the three sets separately, and then integrated the information in the interpretation of findings (Figure 4.1).

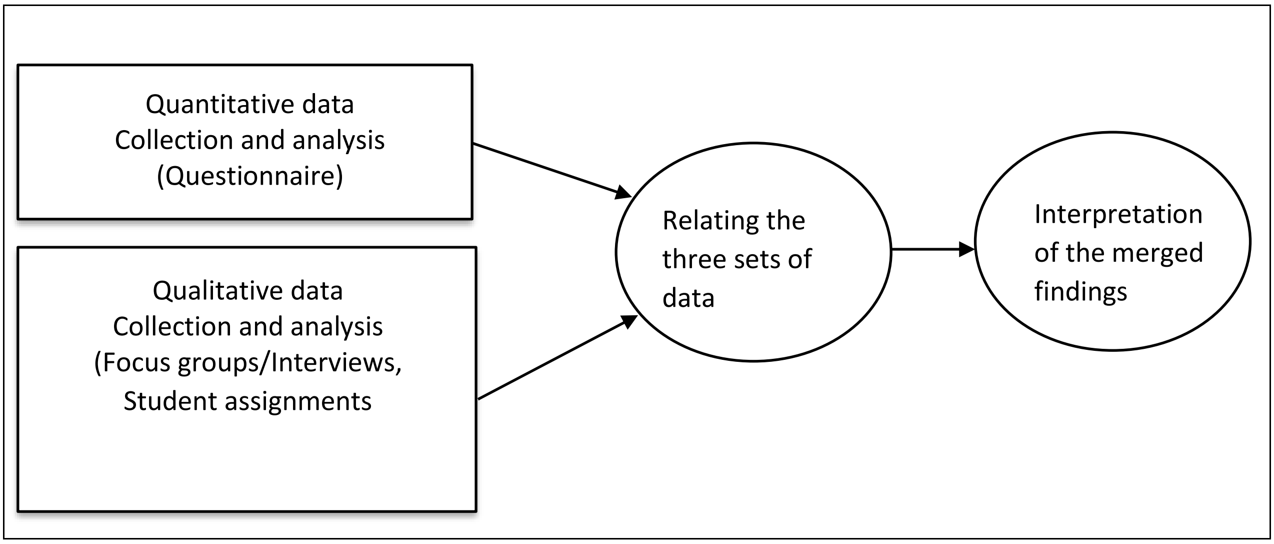

Figure 4.1: The Convergent Parallel Mixed Methods Design (Creswell, 2014:220)

According to Creswell (2014), a potential validity threat of the convergent parallel mixed methods design is the unequal sample sizes of the quantitative and qualitative approaches where researchers tend to have a less clear picture of the qualitative side of the research. In this research study, I attempted to provide this picture by analysing the quantitative and qualitative data separately and then reporting the findings alongside each other. Furthermore, Cresswell (2014) notes that there may be use of different concepts on both approaches which may make it difficult to merge the findings. To overcome this, during data collection, the same constructs were used in both methods, with the intention to enhance synergy between the quantitative and qualitative data. Data from the questionnaire and assignments provided insight into the students' digital literacy practices and socio-cultural factors, while the data from the focus groups/interviews helped me gain an in-depth understanding of the socio-cultural factors influencing students' digital literacy practices and acquisition of digital literacies. Additionally, the data from the student assignments was quantified and used to triangulate student focus group and interview responses. The sample of participants first responded to the questionnaire and then they were invited for further in-depth investigation through the qualitative methods. A strength of this design is that it allowed me to ascertain explanations that would not have been possible had either of the two approaches been implemented separately. In terms of presenting data in Chapter 5, a side-by-side comparison strategy is used where I first present the quantitative data followed by a theme from the qualitative data that confirms, elaborates or explains the quantitative data. The next section describes the data collection process for the research study.

4.6 Data collection methods

The three main forms of data collection were one questionnaire, six focus groups (and two interviews) and students' assignments. The assignments were used to triangulate the students' quantitative and qualitative responses (see Section 4.7.3). This data was collected from February to June in 2016. Firstly, in February, the Commerce students completed the questionnaire and the Humanities students did so in April. Secondly, three focus groups and one interview were held in May for both Commerce and Humanities students. Students were invited to participate in focus group discussions but two (one from each course), who could not make it, offered to participate in an interview. At the beginning of each of these sessions, I also sought the students' permission and consent to access their assignments from the LMS, Vula, to which I had already been granted access by the respective lecturers. I then downloaded the assignments in June 2016. The data collection phases and timelines are illustrated in Figure 4.2 and 4.3, below.

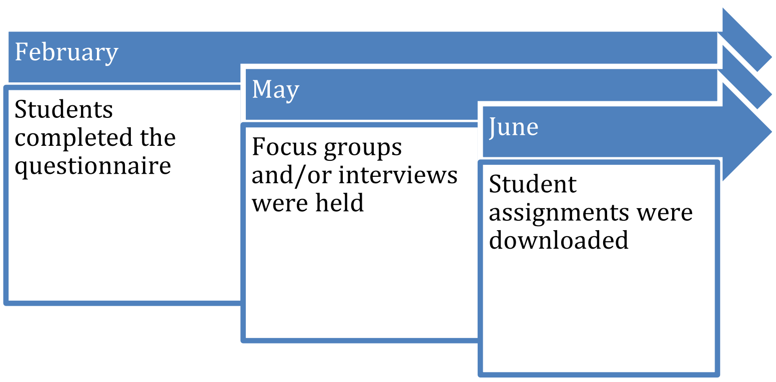

Figure 4.2: Commerce data collection

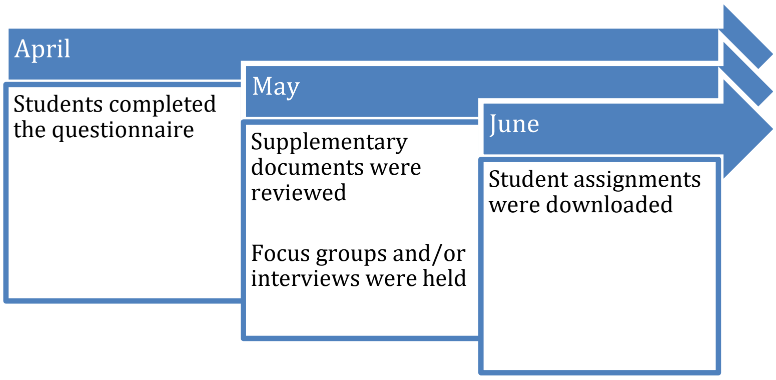

Figure 4.3: Humanities data collection

4.6.1 Questionnaire

The questionnaire (see Appendix A) was used to elicit students' digital literacy practices both prior and while at university. The questionnaire (developed using Google forms) was composed of structured closed and open-ended questions. The closed questions allowed respondents an opportunity to specify 'other options' that were not provided as options in the questionnaire. The open-ended questions allowed students to provide their own short answer responses; there was no limitation of characters. The Google form was printed and distributed manually at the end of lecture periods. Students were then asked to return the completed questionnaire during the next lectures of the respective courses. This allowed students to respond at their own time and pace.

The items in the questionnaire were informed by the digital literacy conceptual framework and data from the interview schedule pilot. In the questionnaire, the first section elicited student demographics and background. The second section focused on students' use of technology for learning and leisure (personal) activities whilst studying at high school. The data elicited from this section was helpful in illuminating students' digital experience and digital identities by the time they enrolled at university. The items in this section were inspired by McKenna (2010) who notes the importance of understanding students' literacy practices that they bring to university; the questions were adapted from Goode (2010a; 2010b) who notes how students' technological proficiency and computing histories influence their engagement in their university work. The third section focused on student technology access and personal and study-related digital literacy practices while they are studying at university. The questions in this section were adapted from work on university first-year students’ use of technology for personal and study purposes (Kennedy, Judd & Churchward, 2008; Thinyane, 2010; Corrin, 2014). Question 23 was informed by Lankshear and Knobel, (2006), O’Reilly (2007) and Wiley (2014) and the last section included questions on student awareness and use of OER. These questions were adapted from the Research on Open Educational Resources for Development (ROER4D) survey of higher education instructors (Oliveira Neto et al., 2017). At the end of the questionnaire, students were asked to indicate their availability for focus group discussions.

In February 2016, the questionnaire was piloted with 11 second-year Humanities students. These students were invited after they met with a colleague who was evaluating the PMD project as these were all tablet recipients. One of the students challenged the binary categories of gender (Male/Female) in the biographical data section of the questionnaire. Hence, I added the option - ‘other’ for other gender categories. Also, I added a column - Not applicable (N/A) to Question 14 because four of the 11 students had added it in their questionnaire. Furthermore, two students added Google Scholar in the ‘Other’ option of Question 15 and so I added Google Scholar to the list of options as this seemed to be an important resource for Humanities students. In response to Question 24, which asked students to tick the purpose (Study only, Personal only, Other, N/A) for which they created or used resources in Question 23, two students indicated that they used videos and websites for both - For study purposes and Personal purposes (by ticking both options). I subsequently added a column – Both study and personal purposes because these students’ responses suggested that there were some of them who created digital resources for both study and personal purposes. I also added the option, ‘I am not sure’ to Question 27 subsequent to one student writing that on his/her questionnaire. In response to Question 28, two students indicated that their lecturer and tutors told them that the resources used in their courses were OER. This sparked my interest in knowing which of their courses (in addition to the ones being researched) used OER. Hence, I added Question 29 - Please specify the name of the course that used OER.

4.6.2 Focus groups and interviews

Due to time constraints, two students (one from each course) who were eager to participate could not make the time slots set for focus groups, hence I conducted individual interviews with them. Focus groups provide a rich, collective view of data rather than an individual one because the data emerges from the interaction of participants (Cohen, Manion & Morrison, 2007). Cohen, Manion and Morrison (2007) acknowledge that a strength of focus groups is that they encourage groups to talk about their practice. Cohen, Manion and Morrison (2011) also highlight that focus group data becomes much richer when participants are 'relative strangers' to each other. This was the case in this research study because the focus groups were primarirly formed based on students' availability. Only one out of the three Commerce focus groups had two participants who were from the same assignment group. Also, one of the three Humanities focus groups was deliberately comprised of students who were tablet recipients as my data collection coincided with the PMD project evaluation and we did not want to make students feel over-researched. For this group, there were two sections for the two sets of questions. However, a shortfall of focus groups that Cohen, Manion and Morrison (2011) identified is that they produce less rich data, in terms of depth, than the one-to-one interviews. I also acknowledge this in the current research. The purpose for collecting qualitative data was to further solicit students' explanations of how and why they take particular actions and the influencing factors for those actions, as well as how they acquired the necessary digital literacy practices. This qualitative data was used as a means of 'completeness' (Tobin & Begley, 2004). According to Tobin and Begley completeness is "a means of enlarging the landscape of inquiry, offering a deeper and more comprehensive picture" (2004:393).

Using Street (2001) and Barton and Hamilton's (2005) concept of a literacy event and Bhatt's description of a digital literacy event, the students' business concept document development and assignment writing served as the literacy events in the respective courses. For the purpose of this study, the literacy events were represented as learning activity systems. The focus group questions (Appendix B) were formulated in such a way that I could determine students' digital literacy practices and the socio-cultural factors influencing the practices in the learning activities. The AT nodes, such as object, subject, tool, rules and norms, division of labour and community were used to guide the development of questions. At the same time, drawing on Gee's (2008) notion of Discourse and literacy, the ways in which students acquired digital literacy skills and practices were also elicited in the focus groups/interviews.

The questions were developed based on the interview schedule that was piloted with eight Commerce students in 2015. The purpose for piloting the schedule was to explore the site – a course that integrates digital literacies into the curriculum, as well as the students' digital literacy practices. This was also a means to develop an interview schedule that was non-existent. In May, I invited the students to focus group discussions. Eight students expressed willingness to participate in the discussion. Due to the manageable size, I conducted one focus group discussion with eight of them at the same time. Findings from the focus group revealed that there was minimal to no understanding of what OER are. Furthermore, some students' digital literacy practices were influenced by their high school practices. Also, some of the students' practices were transferred from their everyday use of technology. These findings informed the development of the questionnaire, questions on students' understanding of licensing of learning materials, and digital literacy practices while at high school and their everyday digital literacy practices at university. With regard to the acquisition of technical practices, some of those students who had never used Google documents at high school applied what they acquired during a workshop in which they participated. Otherwise, those who did not attend the workshop delegated the role of creating and sharing the documents to those who did so. Hence, it was of interest to find out how students acquired digital literacies when they are integrated into the curriculum. It is important to note that in the light of the different contexts and digital literacy events, the questions were adapted for the Humanities students.

4.6.3 Student assignments

Students' written assignments (Appendix C) were used to provide evidence of the digital literacy practices of students; these were used to triangulate students' responses in the questionnaire and focus groups/interviews. That is, "triangulating between and across methods" (Tobin & Begley, 2004:393).

Table 4.1 provides a summary of the research sub-questions and the data collection methods used in response to each sub-question

Table 4.1: Research sub-question and instrument matrix

Concepts and Constructs	**Research question**	**Questionnaire**	**Focus groups/ One-on-one interviews**	**Assignments**
Digital literacy practices while at university	What are first-year higher education students' digital literacy practices in their discipline-specific settings?	Digital literacy practices while at university (Q15 - Q24)	Focus group/ Interview (Q1-Q4)	Digital resources used by students
Factors influencing digital literacy practices	What are the personal and socio-cultural factors influencing students' digital literacy practices?	Gender and age (Q1 and Q2)		
		Access and use of technology prior university (Q6) Digital literacy practices whilst at high school (Q10 - Q12)		
		Technology access and use at university (Q13-14)		
		Awareness of resource licencing alternative to copyright (Q25-31)	Focus group/ Interview (Q7-Q13)	Digital resources used by students
Enablers or contradictions	What are the enablers or contradictions influencing students' digital literacy practices?	Technology access and use at university (Q13-14)	Focus group/ Interview	
Acquisition of digital content-creation literacies	In what ways do first year HE students acquire digital content-creation literacies in their discipline-specific settings?		Focus group/ Interview (Q5 -Q6)	

4.7 Supplementary documentation

Vula sites of the two courses together with the course reader for the Humanities course served as supplementary documents in this research . The Vula course sites and course reader contained the learning resources and questions (instructions) of the LAAs. These two sources were studied to elicit what resources were shared with students, as well as, the assignment instructions.

4.8 Data analysis tools and methods

Analysis of the quantitative data involved a 3-step process. Firstly, the questionnaire data was captured in *Google Forms*, and subsequently exported to, and analysed in, *MS Excel.* The findings are presented in the form of graphs and tables (Chapter 5). Percentages of the total number of each biographical characteristic are used when reporting. For instance, a percentage of 39 or 64 for the Commerce and Humanities disciplines respectively. The data was categorised according to the three dimensions of the digital literacy framework adapted from Ng (2015). Secondly, a chi-square test was used to determine whether there was any significant correlation between variables such as course, age, gender and enrolment in a computing-related subject, and the observed differences in student digital literacy practices. The purpose of this test was to determine "whether groups in a sample are significantly different in some measured attribute or behavior" (Connor-Linton, 2012). For the current research, a threshold of $p < 0.05$ (level of significance) was used. The significant correlations that were revealed in the findings (Chapter 5) are then further discussed in Chapter 6. I also conducted further analysis to determine the groupings (such as younger or older students, male or female students) that may have contributed the most to the significance of the overall chi-square statistic (Schumacker, 2017). Thus, a standardised residual value of 2.0 was used to determine the degree of significance (Schumacker, 2017). Appendix L provides a summary of the factors that have a significant correlation with students' digital literacy practices. Thirdly, in instances where there is a correlation between a particular digital literacy practice and more than one variable, I undertook a TwoStep cluster analysis in SPSS to distinguish the relative importance of the variables. For example, smartphone access compared to discipline and gender. Figure 4.4 below is an illustration of the findings, which reveal that gender is more important than the discipline in terms of smartphone access. In decreasing size of the six clusters, the 34% of students in the cluster is comprised of female students in Humanities, followed by 21.4% with female students in Commerce, 16.5% with male students in Humanities and 14.6% with male students in Commerce. Whereas the 8.7% of students with no access to smartphone is comprised of male students in Humanities and Commerce. Also, the 4.9% with female students in Humanities had no access to smartphones.

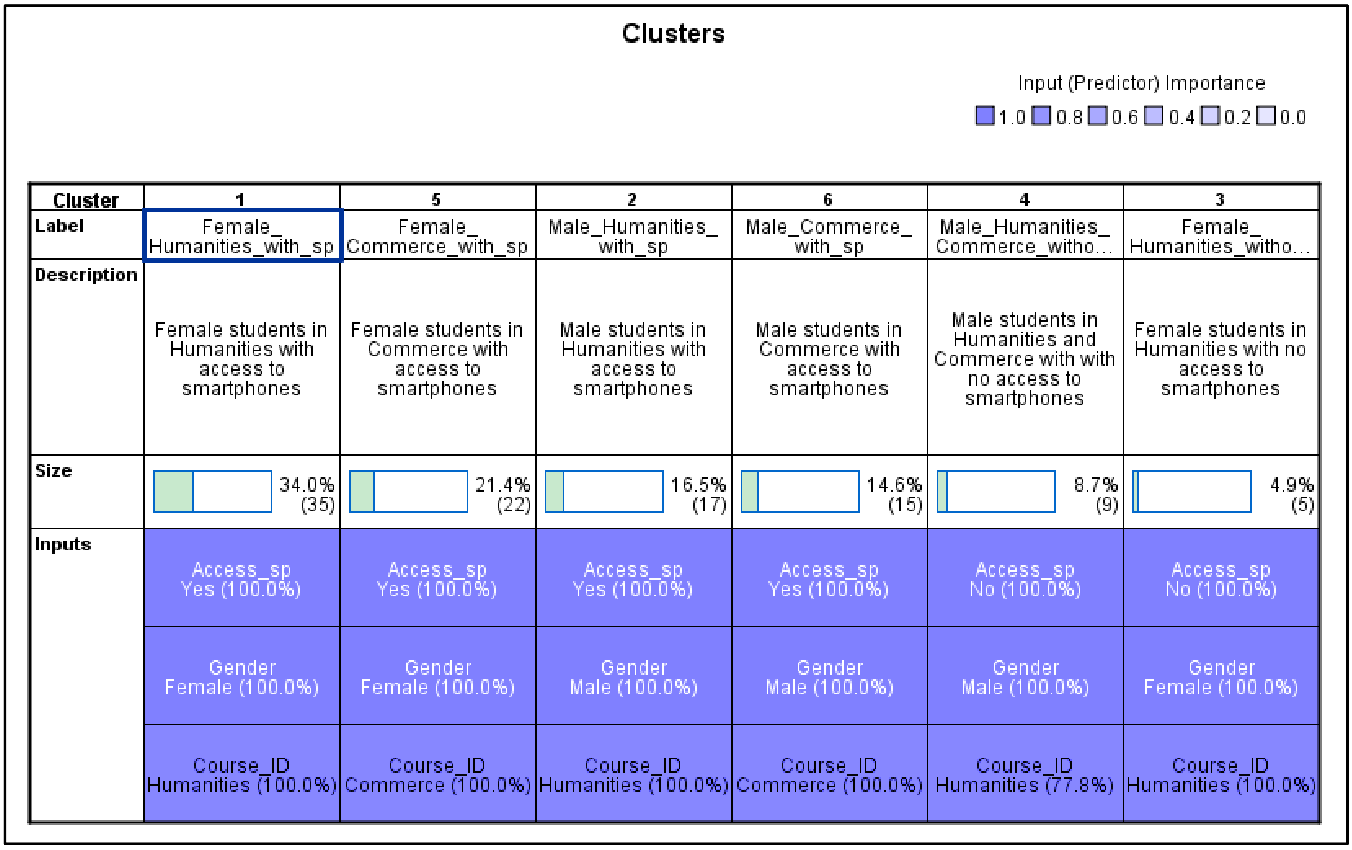

Figure 4.4: An example of TwoStep cluster analysis

However, in Chapter 5, I only describe the level of importance of the multiple variables in relation to the digital literacy practices. Indepth analysis of the cluster is beyond the scope of this study.

The focus group and individual interview discussions were recorded. The audio-tapes were subsequently transcribed and the data analysed, using *NVivo*. I coded the data according to digital literacy practices and AT nodes (see Appendix D). Data elicited in response to questions related to assignment writing, was synthesised using two analytical frameworks – the digital literacy framework and 2nd generation AT nodes (Engeström, 2001), as illustrated in Figure 4.5. Otherwise, the reported digital literacy practices that were not part of the digital literacy event (assignment writing) were merged and interpreted with the quantitative data. These qualitative responses are presented as verbatim quotations alongside the quantitative data. For the verbatim, the alphabet 'G' is used to represent 'focus groups'. For instance, for an excerpt from Focus Group 2 of the Commerce course, I have 'Commerce, G2, line ...'.

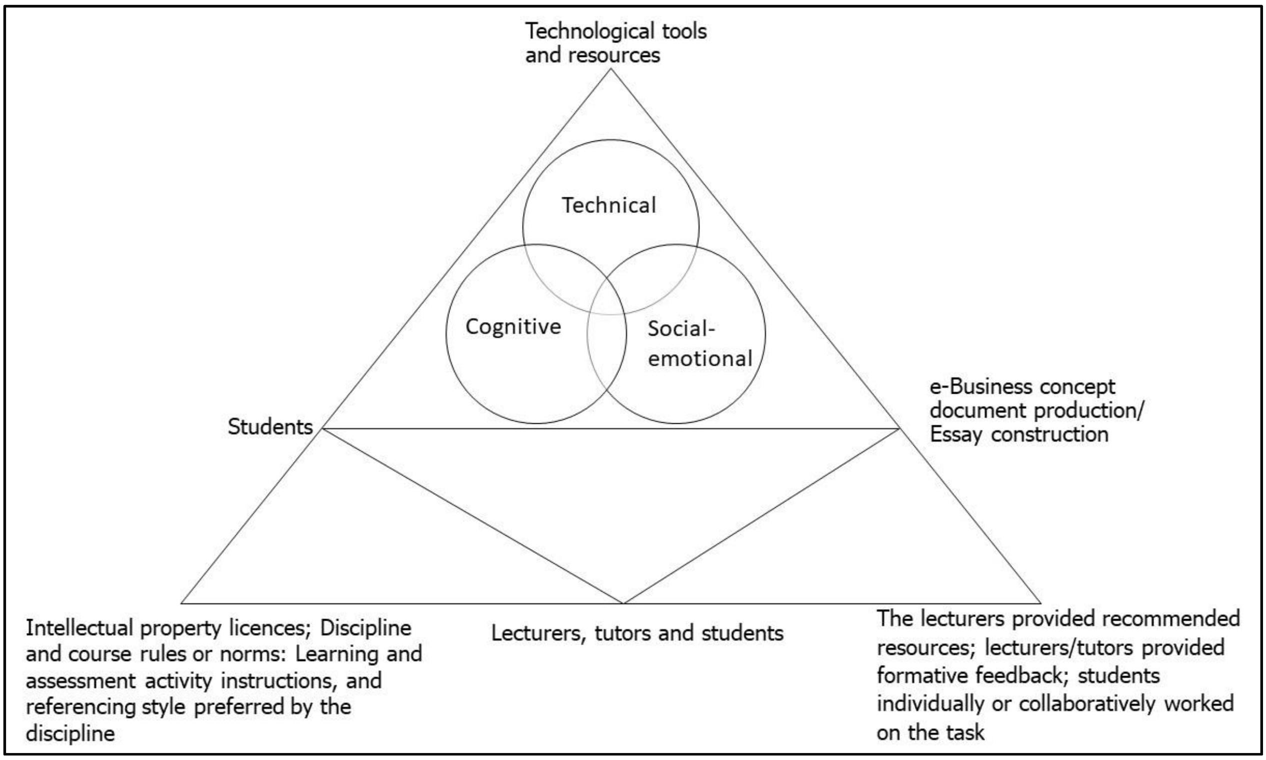

Figure 4.5: A combination of the digital literacy framework and activity theory nodes

AT nodes were used to present the data as subject, tools, object, community, division of labour and rules. The instructions in the Vula sites and course reader (supplementary documents) represent the rules of the student learning system, while the rest of the nodes were elicited from students' responses.

Content analysis (Krippendorff, 1989; 2004) was used to analyse data from students' assignments. Content analysis which was developed for analysing textual materials, is "a technique for making inferences from a focal text to its social context in an objectified manner. … 'Objectified' refers to systematic, procedurally explicit and replicable procedures: it does not suggest a single valid readings of the texts (Bauer, 2000:133). Content analysis research design – Descriptive study that counts the frequency of all the coded features of the text. Although content analysis is often known for its bias toward the present (Bauer, 2000), in this research study this weakness is offset because the student assignments are used to elicit the present as well as the absent. That is, content analysis is used alongside the learning and assessment activity instructions to quantify what resources students used or did not use in their activities. I manually counted the resources used by students in all three assignments in Humanities and one assignment in Commerce. These were then presented in the form of a table (Appendix K). The content items were used to draw inductive inferences related to students' awareness of resource licencing alternative to copyright, as well as digital literacy practices such as searching for information on the internet and selecting appropriate digital technologies. These findings were subsequently reported alongside the quantitative and qualitative data from the focus groups/inteviews.

Furthermore, the qualitative data also revealed how students acquired digital literacy practices. Using NVivo, I created three child nodes of learning or acquisition; what digital literacy skills and/or practices students acquired, how students acquired these and why they acquired them (Figure 4.6).

Figure 4.6: NVivo analysis of students' acquisition of digital literacies

Gee's (2008) principles of literacy and Discourse acquisition were used to interpret how students acquired the respective digital literacy practices. Four modes of inferences were used in an endeavour to make meaning of the findings. These are discussed in the next section.

4.9 Modes of inference

The critical realist framing utilises four modes of inference such as induction, deduction, abduction and retroduction (as described in Section 3.2) (Danermark et al., 2002). Easton asserts that "induction provides the event data to be explained" (2010: 124). In the current research study, themes that emerged from the qualitative data provided examples of students' digital literacy practices. The deductive process uses a theory or a set of concepts from various theories to deduce what will be observed empirically. This means that "deduction helps to identify the phenomenon of interest, suggests what mechanism may be at play and provide links with previous research and literature" (Easton, 2010:124). In the current research, I employed the digital literacy practices framework and Vygotsky's model of mediated act, which is the top triangle of Engeström's (2001) 2nd generation Activity theory, to determine students' digital literacy practices. I drew on related literature and research on digital literacy practices and CHAT to help me explain the factors influencing students' digital literacy practices. Abduction is "to interpret and recontextualise individual phenomena within a conceptual framework or set of ideas" (Danermark et al., 2002:80). I used the ideology of a social practice, CHAT's notion of volition, historicity and contradictions and Gee's (2008) principles of literacy and Discourse acquisition to help me interpret students' digital literacy practices and acquisition of digital content-creation literacies. This process endeavoured to explain the possible causal mechanisms of why students carried out the digital literacy practices in the way in which they did and why they acquired the digital literacies in the respective settings. Table 4.2 below, provides a summary of the interconnection between the theoretical resources discussed in Chapter 3 together with examples of how the theoretical resources helped with data collection and analysis.

Table 4.2: Summary of theoretical resources and their use for data collection and analysis

Digital literacy practices ideology of events and practices			Mode of inference	
Research question addressed	Sources of data analysed	Conceptual/Theoretical resource/analytical frameworks		
What are first-year higher education students' digital literacy practices in their discipline-specific settings?	Questionnaire (Appendix A)	Digital literacy practices framework (Ng, 2015)	Deductive analysis of the student responses in the questionnaire	
	Focus groups/ One-on-one Interviews (Appendix B)	Digital literacy practices framework (Ng, 2015) and 2nd generation CHAT nodes (Engeström, 2001)	Deductive analysis using the two frameworks, and abduction drawing on CHAT and ideology of a social practice (with respect to the digital literacy event - assignment writing) Inductive analysis to establish themes from the reported digital literacy practices that were not part of the digital literacy event (assignment writing) Deductive analysis – the themes from the inductive analysis were then compared to the data from the questionnaire in order to provide possible explanations of why or how students undertook certain digital literacy practices	
What are the personal and socio-cultural factors influencing students' digital literacy practices?	Questionnaire (Appendix A)	Digital literacy practices framework (Ng, 2015)	Deductive analysis with respect to discipline, age, gender	Retroduction using critical realism's causal mechanisms that endeavour to explain what personal and socio-cultural factors (such as volition, course culture and the
	Focus groups/ One-on-one Interviews	2nd generation CHAT (Engeström, 2001)	Deductive analysis with respect to rules (for example, activity instructions) and division of labour	

	(Appendix B)		Abductive analysis using CHAT's notion of volition	instructions of learning and assessment activities) were influencing students' digital literacy practices
	Assignments (Appendix C)	Content analysis (Krippendorff, 1989; Bauer, 2000)	Inductive and deductive analysis of students' awareness of resource licencing alternative to copyright	
What are the enablers or contradictions influencing students' digital literacy practices?	Questionnaire (Appendix A)	Digital literacy practices framework (Ng, 2015)	Deductive analysis – enabling environment with respect to technology access	Retroduction underpinned by causal mechanisms to establish: 1) what the learning environment must be like for students to effectively engage in their digital literacy practices and 2) what might have caused the contradictions in the students' learning systems
	Focus groups/ One-on-one Interviews (Appendix B)	2nd generation CHAT (Engeström, 2001)	Inductive analysis of reported digital literacy practices of those students staying on or off-campus Abductive analysis using CHAT's notion of contradictions	
In what ways do first year HE students acquire digital content-creation literacies in their discipline-specific settings?	Focus groups/ One-on-one Interviews (Appendix B)	Gee's (2008) principles of literacy and Discourse acquisition Scribner and Cole's (1981) perspective of the 'practice account of literacy' - notion of learning within a social practice	Abductive analysis drawing on Scribner and Cole's (1981) perspective on the 'practice account of literacy' and using Gee's (2008) principles of literacy and Discourse acquisition	Retroduction using critical realism's causal mechanisms that endeavour to explain why acquisition of digital literacies is taking place in the respective settings

4.10 Validity and trustworthiness

Guba and Lincoln (1982) describe four criteria for validating the quality of a research enquiry. These are credibility, transferability, dependability and confirmability. With respect to credibility, in the current research study, students' assignments were used to triangulate students' focus group/interview responses. Additionally, to reduce biases, verbatim transcripts of respondents are used to report on the findings of the interview data (Maxwell, 2008). According to Maxwell (2008), verbatim transcripts of interviews provide rich data compared to only notes on what a researcher might have felt was significant. Regarding transferability, the findings of this research, conducted with a purposive sample of first-year students in a HEI within a developing country, may be transferrable to a similar context. Dependability addresses the notion of replicability and reliability (Guba & Lincoln, 1982). In this research, I used a 'stepwise replication' (Guba & Lincoln, 1982) approach to collect data in two courses that are based in two disciplines to collate student digital literacy practices and how they acquired them (see Section 4.7). The data collection and analysis methods used in this research study are recorded and the data collection instruments are shared in the appendices, to enhance confirmability.

4.11 Ethics consideration

Permission for access to the students was sought from the lecturers of the respective courses. Students from both courses were invited to participate in the research study. The purpose of the study and the methods that were going to be used in the research were explained to them and they were also given an accompanying information sheet (Appendix E). They were also informed of what was expected of them and that they were free to withdraw from the research at any stage. The participants were assured of data confidentiality, which was maintained all the time. No participants' identity was attached to the data. The courses are presented as Commerce and Humanities courses respectively. See appendices E-H for ethics clearance documents.

4.12 Chapter summary

In this chapter, the case study design with a mixed-methods approach were chosen as the appropriate methodology for addressing the research question. The chapter further discusses how Ng’s (2015) adapted digital literacy framework and Engeström’s (2001) 2nd generation Activity theory (AT) are used to analyse the data. Gee’s (2008) principles of literacy and Discourse acquisition inform the interpretation of student acquisition of digital literacy practices. Validity and ethical measures and trustworthiness as applied in this study are also discussed. The next chapter presents the findings of this research study.

Chapter 5: Analysis

5.1 Introduction

This chapter presents data in relation to the four sub-questions. That means, in addition to student demographics and background, the data is presented in three parts: Part 1 presents data in response to sub-question 1 – student digital literacy practices in their discipline-specific settings. Part 2 includes data on personal and socio-cultural factors that influence student digital- literacy practices in the respective disciplines. Related to Part 2, I present data on the students' digital literacy practices prior to enrolling for university studies, as the findings reveal that some of these practices influence the students' university digital literacy practices. The findings draw on data from a questionnaire, focus groups/interviews and students' assignments. Findings from the the questionnaire are presented in terms of the student discipline, age, gender, whether or not students enrolled for a computing-related subject at high school, and other factors influencing students' discipline-related digital literacy practices at university. Findings from the focus groups/interview and assignments are reported alongside these to either corroborate or highlight potential tensions in the findings drawn from the data sets.

Parts 1 and 2 also surface data in response to sub-questions 3 – The current enablers or contradictions influencing the students' digital literacy practices in their discipline-specific settings. Part 4 includes data that highlights the ways in which the students acquire digital content-creation literacies in their discipline-specific settings through creation of content in their respective courses.

5.2 Demographic data

A total of 103 students (39 from Commerce and 64 from Humanities), comprising 62 females and 41 males, completed the questionnaire. In Commerce, there was a gender distribution of 56% females and 44% males while, in Humanities, there were 63% and 38% females and males respectively. Overall, respondents' age distribution ranged from $\leq$18 years (25%), 19-22 years (72%) and 23-26 years (2%) and one participant (1%) did not respond. Due to the very small sample (n = 2) of the 23-26 years old students, I have not included this age group in the analysis. That is, for age, I only report on 100 students. Furthermore, there were six focus groups and two individual interviews (total of 27 participants) and assignments of the 27 participants.

A summary of the participant demographics in the two courses is provided in Table 5.1 below.

Table 5.1: Participant demographics in the two courses

Courses	**Commerce course**		**Humanities Course**	
Instrument	**Questionnaire**	**Focus group/Interview and assignments**	**Questionnaire**	**Focus group/Interview and artefacts**
Number of Participants	n = 39	n = 11	n = 64	n = 16
Gender distribution				
Females = 60% (n = 62) and males = 40% (n= 41)	Female = 56% (n = 22) Male = 44% (n = 17)	Female = 4 Male = 7	Female = 63% (n = 40) Males = 38% (n = 24)	Female = 9 Male = 7
Age distribution				
≤18 years = 25% (n = 26) 19-22 years = 72% (n= 74) 23-26 years = 2% (n=2)	≤ 18 years = 38% (n = 10) 19-22 years = 74% (n = 29)	n = 1 n = 10	≤ 18 years = 25% (n = 16) 19-22 years = 70% (n= 45) 23-26 years =3% (n = 2) 1 (2%) participant did not respond	n = 5 n = 11

5.3 Student digital literacy practices before enrolling for university studies

This section provides a description of student technology (computer, smartphone and internet) access and use (technical dimension) before enrolling at university. Technology use includes high school learning activities and leisure (or personal) technology-related activities, which are in the technical, cognitive and social-emotional dimensions of digital literacy practices. I have also included enrolment in a computing-related subject whilst at high school as part of students' prior experience in digital technology use. It is important to note that I did not conduct a Chi-Square test between students' digital literacy practices whilst in high school and their university disciplines because the disciplines have no influence on the high school practices, but the findings provide a crude indication of the students' digital literacy practices before they enrolled in the respective disciplines.

5.3.1 Student access and use of devices before enrolling for university studies

Both Commerce and Humanities students were asked to indicate what technologies (any type of computer, smartphone and internet) they had accessed while attending high school (Appendix A, Question 6). The data reveals that 76% (78) of the respondents had access to computers while 19% (20) of participants had no access to computers at all, while five did not respond. Also 85% (87) of participants accessed smartphones while 13% (13) participants had no access to smartphones at all and three did not respond (Figure 5.1)

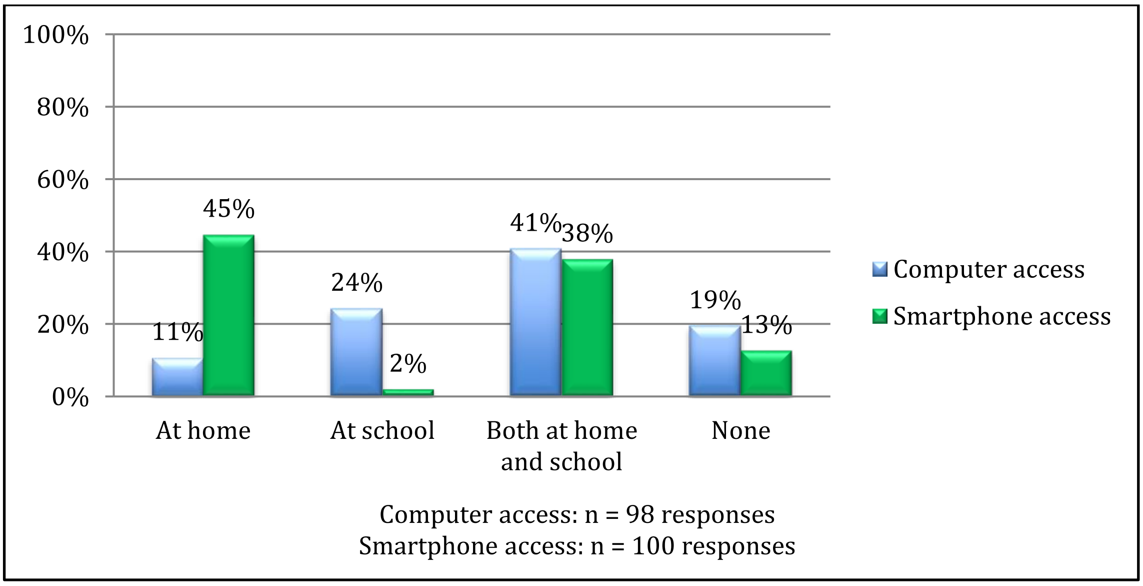

Figure 5.1: Student access to computers and smartphones while at high school

A large percentage of respondents (41%) accessed computers both at home and school, 24% and 11% respondents respectively accessed computers only at school or home. In terms of smartphone access, the largest percentage of participants (45%) accessed smartphones at home, 38% at both home and school and 2% (or n=2) at school only. Furthermore, the quantitative data reflects that 7% (n = 7) of students neither had access to a computer nor a smartphone while at high school (Appendix I, Table 1).

Disciplines and device access

In relation to the courses for which students enrolled at university, a higher percentage of the Commerce students had access to both computers (75%) and smartphones (93%) when compared to the Humanities students (Figure 5.2).

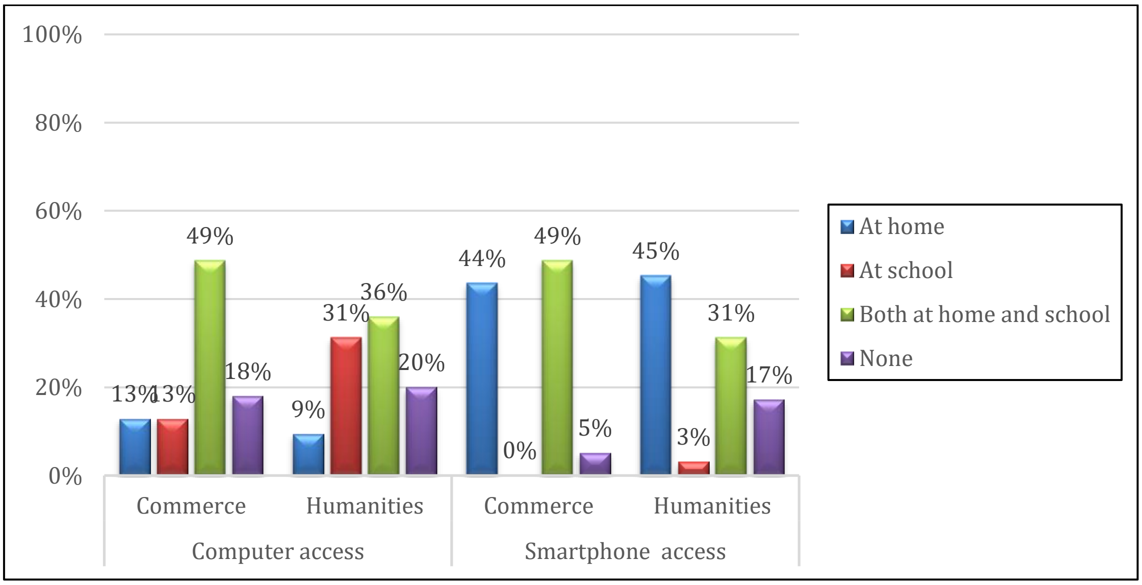

Figure 5.2: Student access to devices while at high school and their university disciplines

Seven (18%) and 13 (20%) of the 20 students without computer access were from Commerce and Humanities respectively. Additionally, two (5%) and 11 (17%) students of the Commerce course and Humanities course respectively did not have access to smartphones. This is a concern as these students may not have had an opportunity to use technology while they were at high school. For instance, from the qualitative data, two Humanities students revealed that only the computer application technology (CAT) students were allowed to use the school computers (and at one of their schools, CAT students paid a lab fee). One of these respondents said that she used a desktop computer at home, while the other one did not have any computer access at home. In addition to the above, the data reveals that there were two (3%) Humanities students who accessed smartphones only while they were at school. This implies that these participants could have been using other students' smartphones at school.

Age and device access

A larger percentage of both age groups (77% and 75% respectively) had access to computers when compared to those who had no access while studying at high school (Figure 5.3). One of those students who was 18 years or younger and four of those students between 19 and 22 years old did not respond to this question.

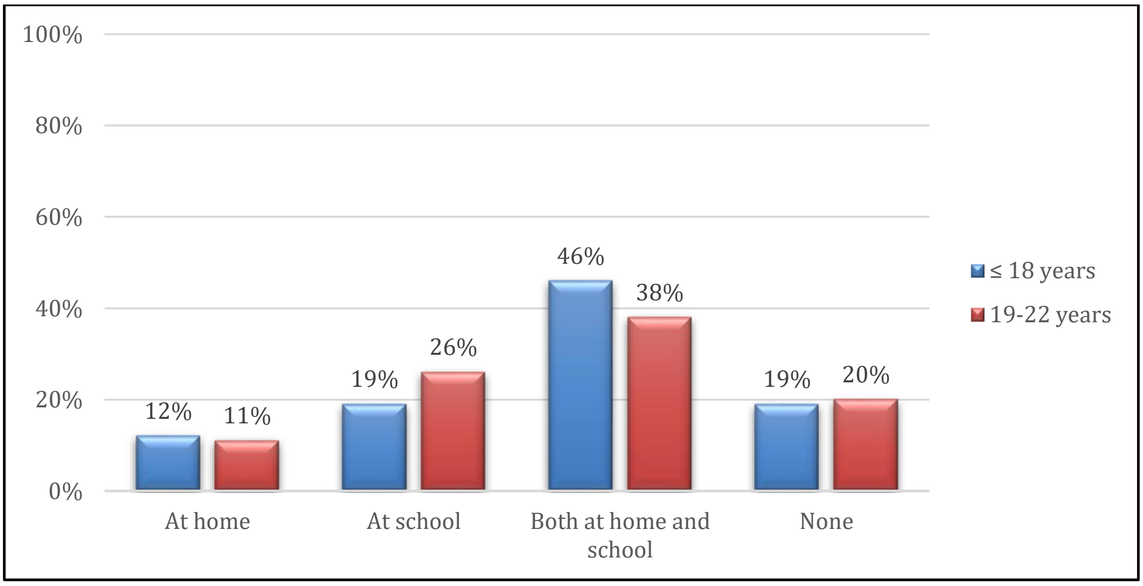

Figure 5.3: Age and computer access while at high school

A larger percentage (26%) of those between 19 and 22 years old compared to those 18 years or younger (19%) only accessed computers at school, while a lower percentage of the former (38%) than the latter (46%) accessed computers both at home and school.

With respect to smartphones, a total of 81% and 86% of those 18 years old or younger, and those between 19 and 22 years old respectively, had smartphone access while at high school (at home, at school or both) (Figure 5.4). At the same time, 19% of those who were 18 years or younger had no access to smartphones. Three of those students between 19 and 22 years old did not respond to this question.

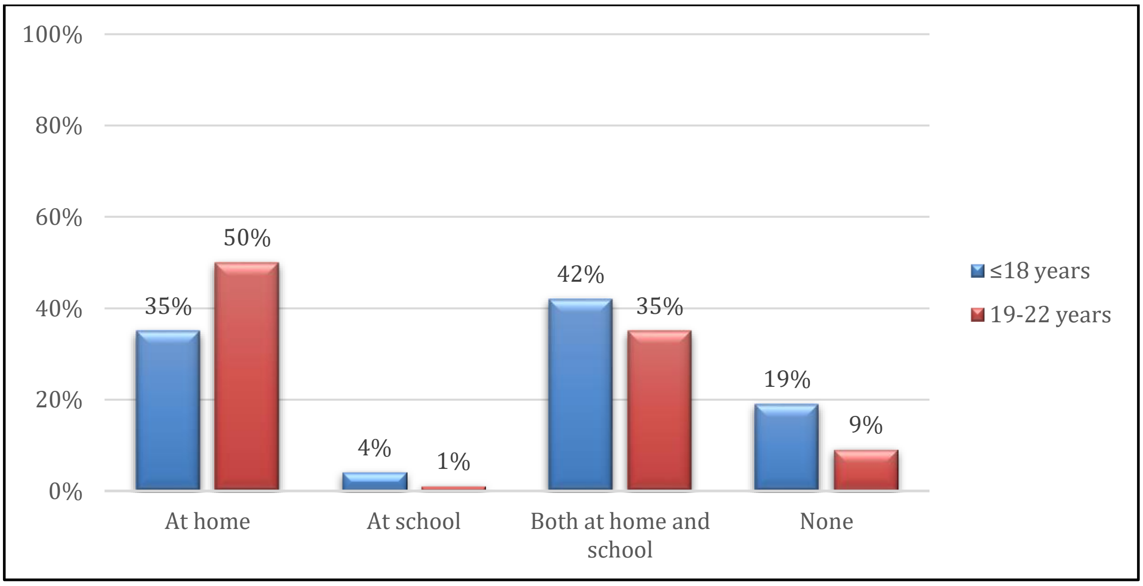

Figure 5.4: Age and smartphone access while at high school

A higher percentage (50%) of those between 19 and 22 years old than those 18 years or younger (35%) accessed smartphones at home only. Also 35% and 42% of those between 19 and 22 years old, and those 18 years old or younger respectively, accessed smartphones both at home and school. This implies that fewer of the participants between 19 and 22 years old took their smartphones to school with them. No statistical correlation was found between age and device access. Most noticeably, a mere 1% of those between the ages of 19 and 22 used a smartphone at school and only 4% of those 18 years or younger did the same.

Gender and device access

Generally, a high percentage of females (77%) and males (72%) had access to computers while studying at high school (at home, at school or both). A higher percentage (13%) of females than males (7%) had access to computers only at home, but they had very similar levels of access at both home and school (40-41%) and at school (24%) (Figure 5.5). Two female and two male students did not respond to this question.

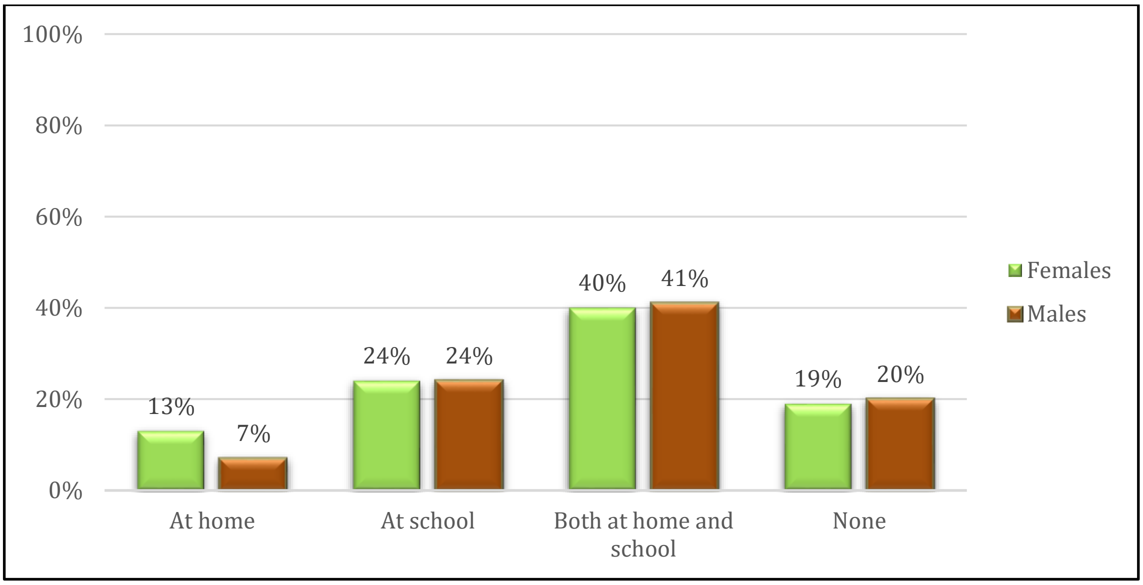

Figure 5.5: Gender and computer access while at high school

With respect to smartphones, a very high percentage of both females (86%) and males (82%) had access to smartphones while studying at high school. Forty-four per cent of females and 46% of males accessed smartphones at home only, while 40% and 34% respectively accessed smartphones at both home and school.

Only 2% of both female and male students accessed smartphones at school (Figure 5.6). One male and two female students did not respond to this question.

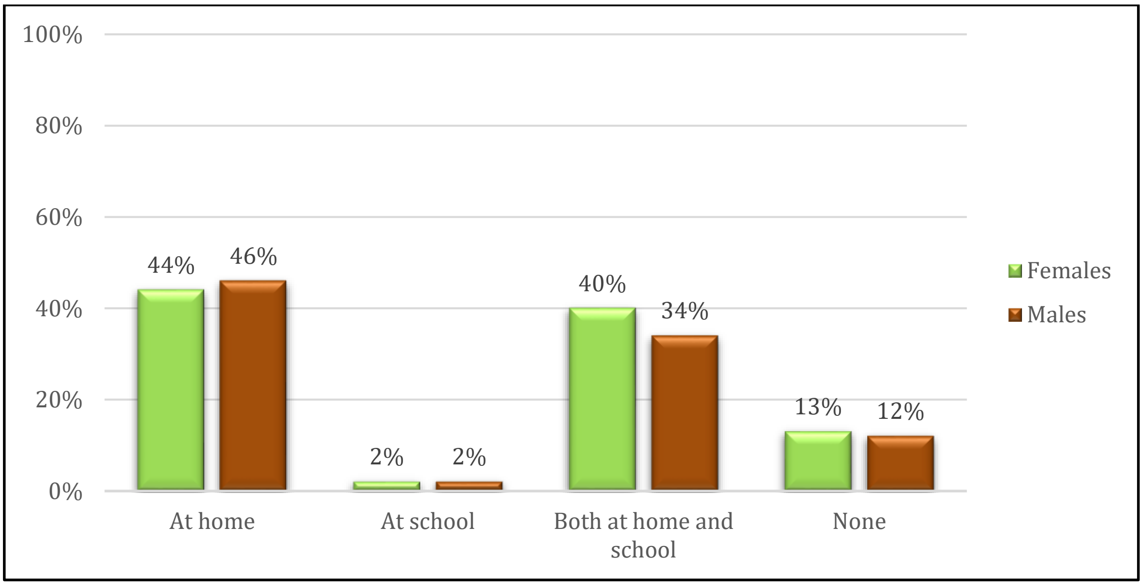

Figure 5.6: Gender and smartphone access while at high school

These findings show that a slightly higher percentage of females accessed smartphones both at home and school when compared to males. However, there was no statistical correlation between gender and computer and smartphone access.

5.3.1 Student access to internet connectivity before enrolling for university studies

Most respondents (85% or n = 87) had internet connectivity whereas 7% (n = 7) had none when they had been studying at high school (Figure 5.7). Nine students (9%) did not respond to this question.

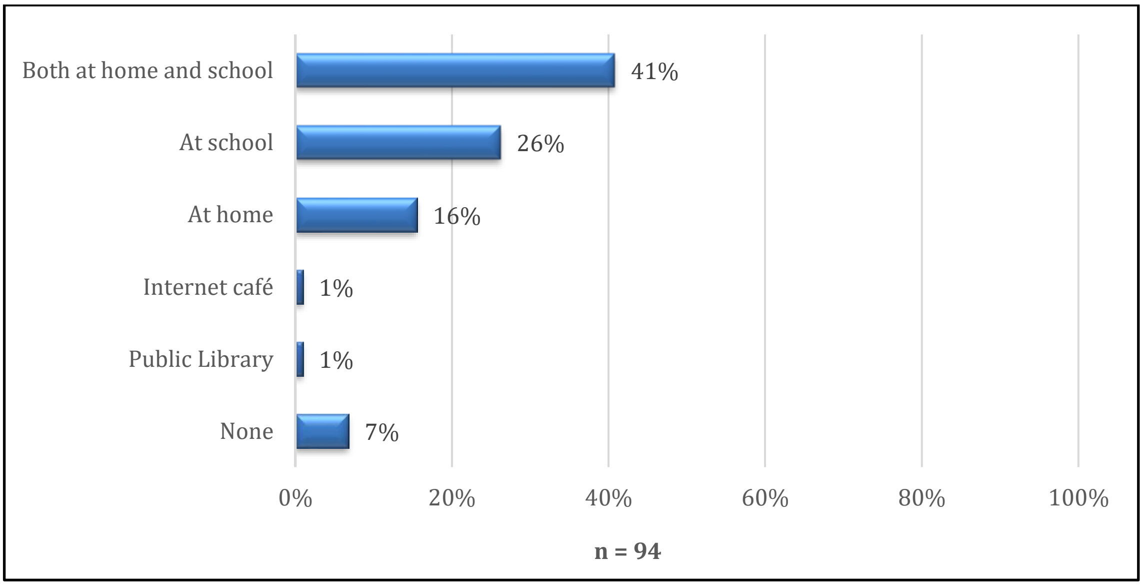

Figure 5.7: Student internet connectivity while at high school

In descending order, 41% of students had internet connectivity both at home and school, 26 % students at school and only 16% at home. Also, one student accessed the internet from an internet café while another student accessed the internet from a public library. Of the seven (7%) students without internet connectivity, two had neither access to a computer nor a smartphone (Appendix I, Table 2).

Discipline and internet connectivity

In relation to the courses for which students enrolled at university, 91% of Commerce students had internet access while at high school when compared to the 82% of Humanities students (Figure 5.8).

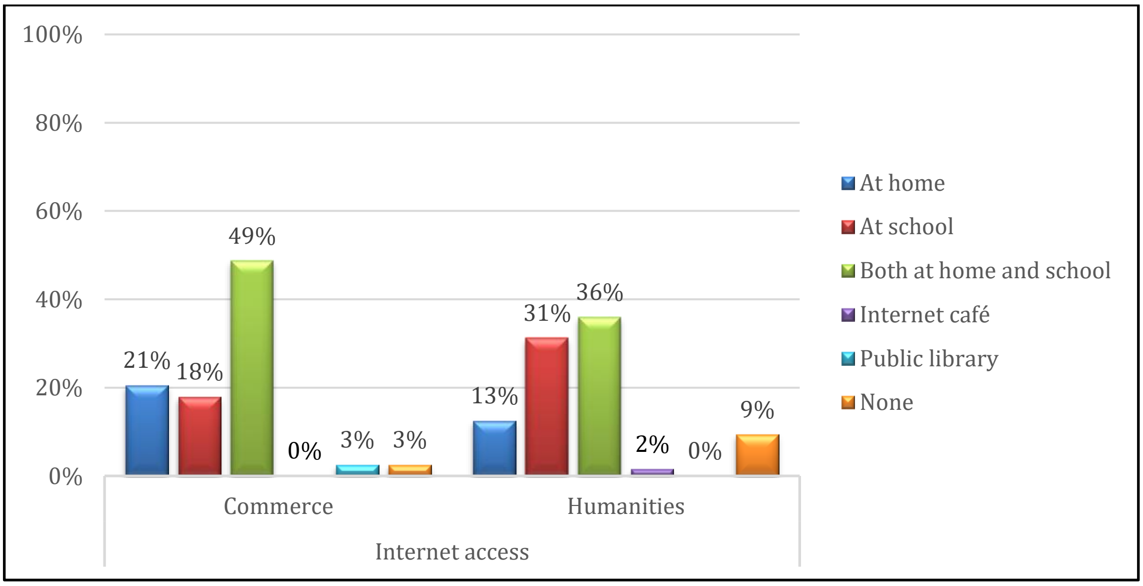

Figure 5.8: Student internet connectivity while at high school and their university disciplines

Of the seven students without Internet access, as mentioned above, only one (3%) was from Commerce while the other six (9%) were from Humanities.

Age and internet connectivity

Overall 85% and 84% of those 18 years old or younger, and those between 19 and 22 years old respectively, had internet connectivity at high school (Figure 5.9).

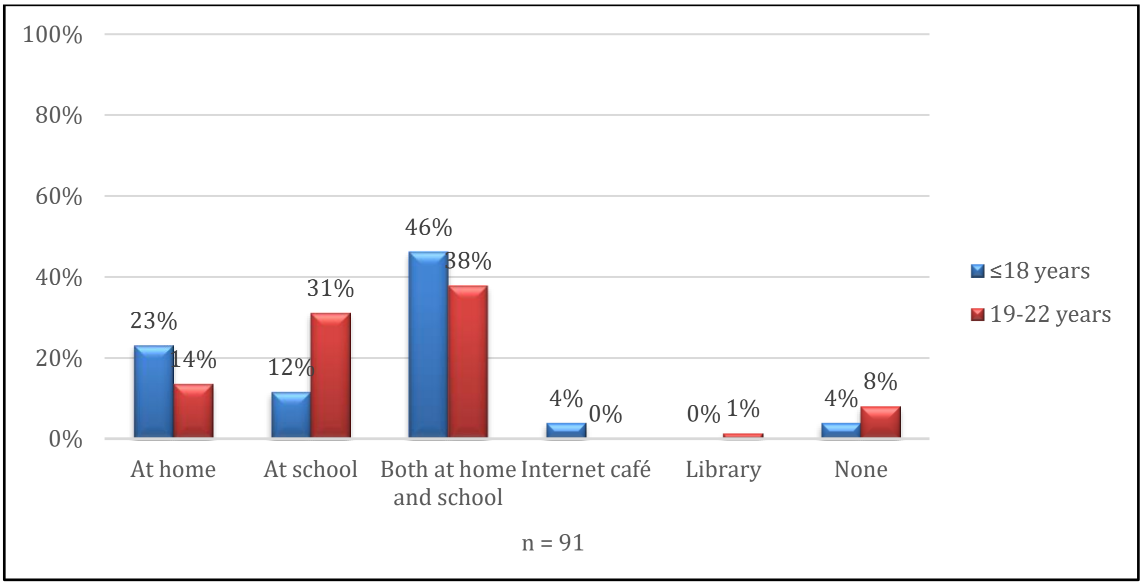

Figure 5.9: Age and internet connectivity while at high school

Both age groups primarily accessed the internet both at home and school, with 46% of those 18 years or younger and 38% of those between 19 and 22 years old. Additionally, a higher percentage of those 18 years or younger (23%) than those between 19 and 22 years old (14%) accessed the internet at home, while a higher percentage of those between 19 and 22 years (31%) than those 18 years or younger (12%) accessed the internet at school, and 4% and 8% of the younger and older groups respectively, had no internet access at all. There was no correlation between age and internet access.

Gender and internet connectivity

Overall a higher percentage of females (92%) than that of males (72%) had internet connectivity at high school (Figure 5.10).

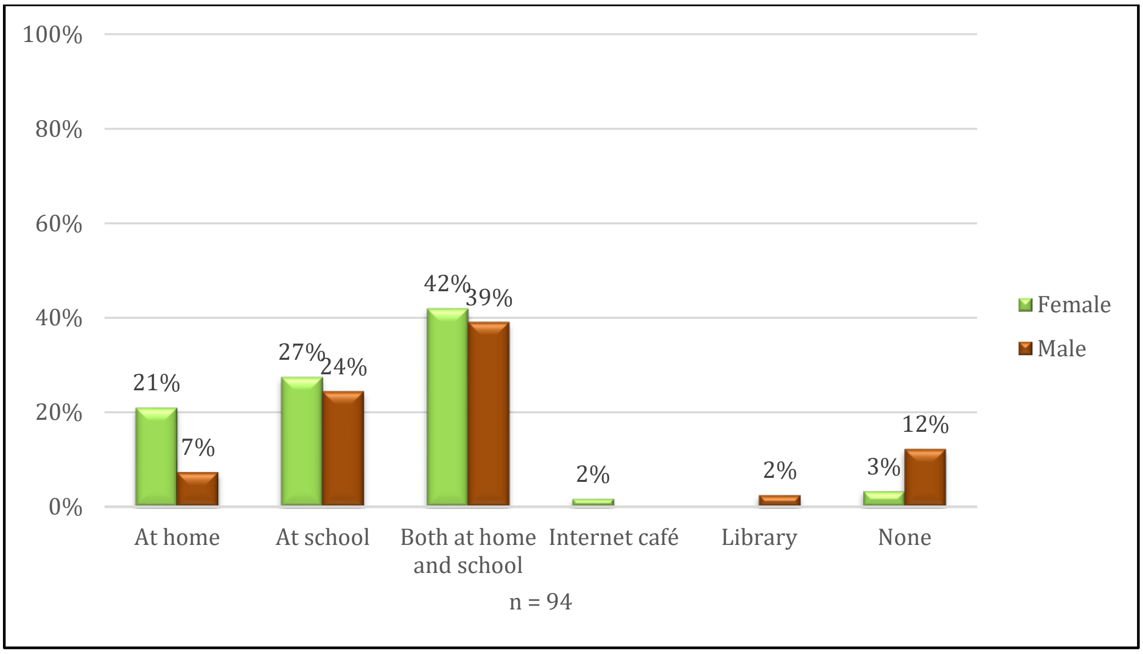

Figure 5.10: Gender and internet connectivity while at high school

Higher percentages of females than males accessed the internet at the various locations. At the same time, a higher percentage of males (12%) compared to females (3%) did not have internet connectivity at all. A Chi Square test revealed that there was a significant correlation between gender and internet access ($p < 0.05$); females had better access to internet than males when at high school.

5.3.2 Use of technology for learning activities and leisure at high school

Participants were asked what learning activities they used technology for at high school (Appendix A, Question 10). Respondents were allowed to tick all the activities they carried out (multiple response). These activities included:

- technical practices such as submitting assignments by e-mail, sharing files with teachers and classmates using cloud-based storage and using the school library's electronic catalogue to find books;
- techno-cognitive practices such as searching for information on the internet for their studies; and

- practices in the cognitive and social-emotional dimension, such as collaborating with peers on assignments or projects.

In descending order, respondents most frequently searched for information on the internet for their studies (91%, n = 94), collaborated on their assignments or projects (42%, n = 43), shared files with their teachers and classmates using cloud-based storage (such as Google drive, and Dropbox) (22%, n = 23), used the school library's electronic catalogue to find books (17%, n = 17), and submitted assignments by e-mail (14%, n = 14), while six (6%, n = 6) never used any technology for their learning activities (Figure 5. 11).

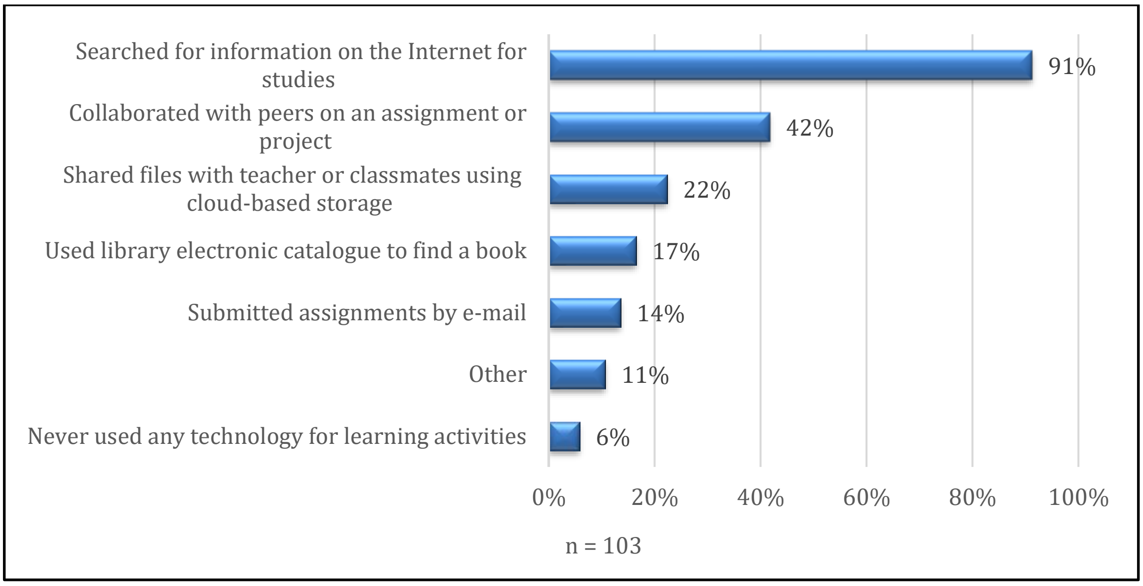

Figure 5.11: Use of technology for high school learning activities

As respondents were also asked to specify any other learning activities for which they used technology, 11% (n =11) indicated that they used technology for applying for admission (n = 3), researching (n = 2), downloading past papers (n = 1), doing English online work (n = 1), printing (n = 1), sending e-mails (n = 1), sending e-mails to bursars (n = 1), accessing online textbooks (n = 1), and watching videos before practicals (n = 1).

In relation to the courses for which students enrolled at university, students from both courses frequently searched for information on the internet as part of their learning activities (Figure 5.12).

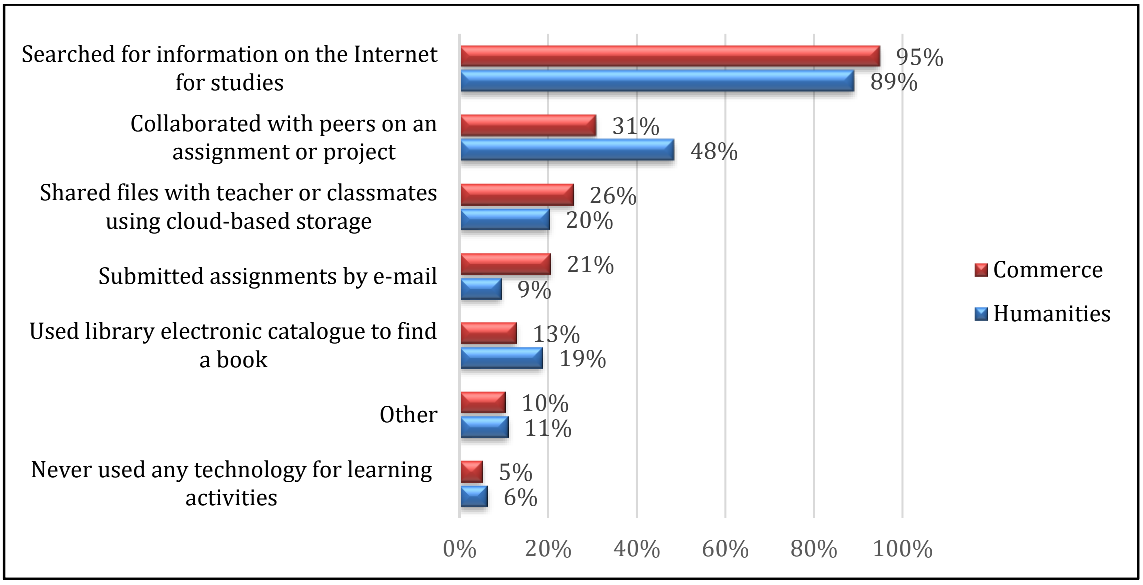

Figure 5.12: Student use of technology for high school learning activities and their university disciplines

Most noticeable is that a higher percentage (48%) of Humanities students collaborated with peers on an assignment or project (cognitive and social-emotional practice) when compared to the Commerce students; whereas more (21%) of Commerce students than Humanities students submitted assignments by e-mail (technical practice).

In terms of age, the data reveals that 100% of those who were 18 years or younger searched for information on the internet while at high school (Figure 5.13).

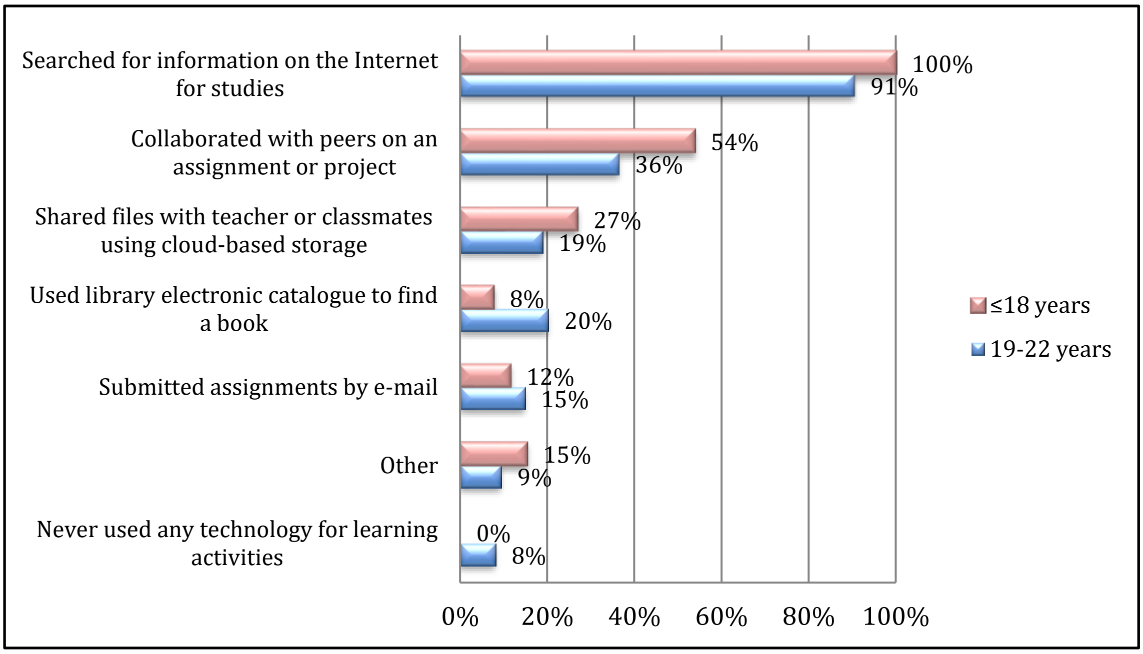

Figure 5.13: Age and use of technology for high school learning activities

In addition to searching for information (the highest percentage for both age groups), a higher percentage of those students who were 18 years or younger collaborated with peers on an assignment or project, and shared files with teachers and classmates using cloud-based storage, while more of those who were between 19 and 22 years old commonly engaged in finding books in the library electronic catalogue. A Chi Square test revealed that there was a correlation between the younger students and the techno-cognitive practice of searching for information on the internet for their studies ($p < 0.05$). However, there was no correlation between those students between 19 and 22 years old and use of a library electronic catalogue to find a book, although there was a noticeable difference between the two age groups in terms of percentages. Furthermore, 8% of those between 19 and 22 years old had never used any technology for their learning activities while at high school.

Furthermore, in terms of gender, the data reveals that 98% of females and 80% of males mainly used technologies to search for information for their studies (Figure 5.14).

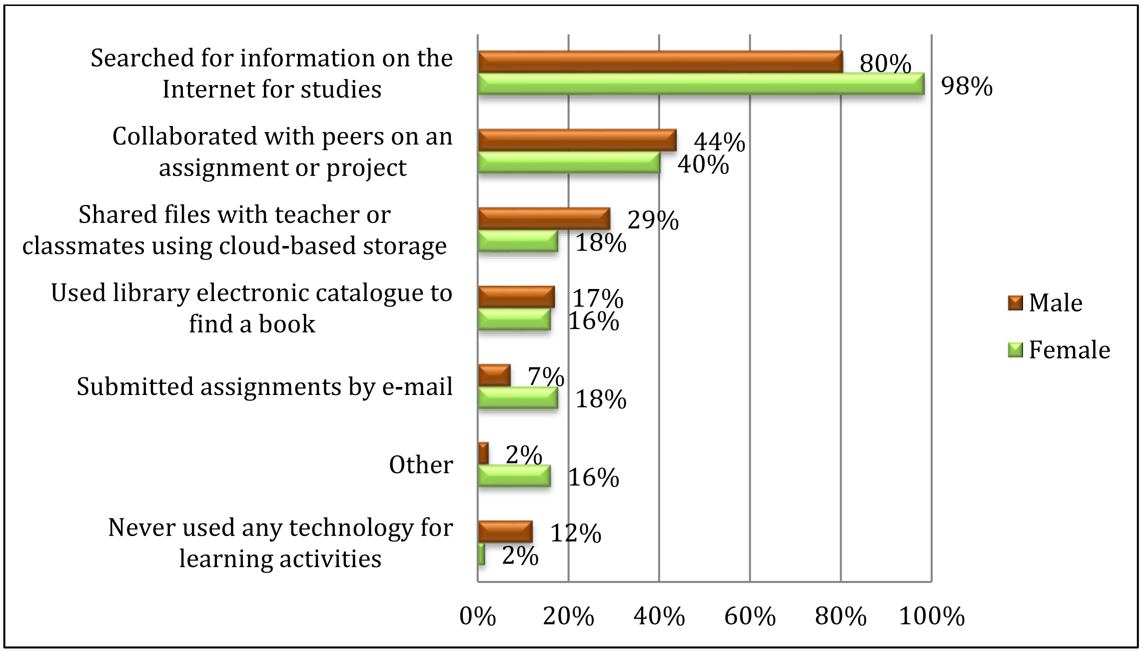

Figure 5.14: Gender and use of technology for high school learning activities

The data reveals that a higher percentage of males collaborated with their peers (44%) and shared files using cloud-based storage (29%), while a higher percentage of females submitted assignments by e-mail (18%) and engaged in other learning activities (16%) as compared to males (7% submitted assignments by e-mail and 2% engaged in other learning activities). Furthermore, a higher percentage of males (12%) than females (2%) had never used any technology for their learning activities. A Chi Square test also revealed a significant correlation between being female and the techno-cognitive practice of searching for information on the internet for studies ($p < 0.05$) and being male and non-use of technology for learning activities ($p < 0.05$) whilst at high school.

Computer access and high school learning activities

With participants accessing technology at different locations, it was of interest to find out what specific learning activities students engaged in at these various locations.

Figure 5.15 shows the computer location mapped against the percentage of the total number of students who carried out each learning activity at high school.

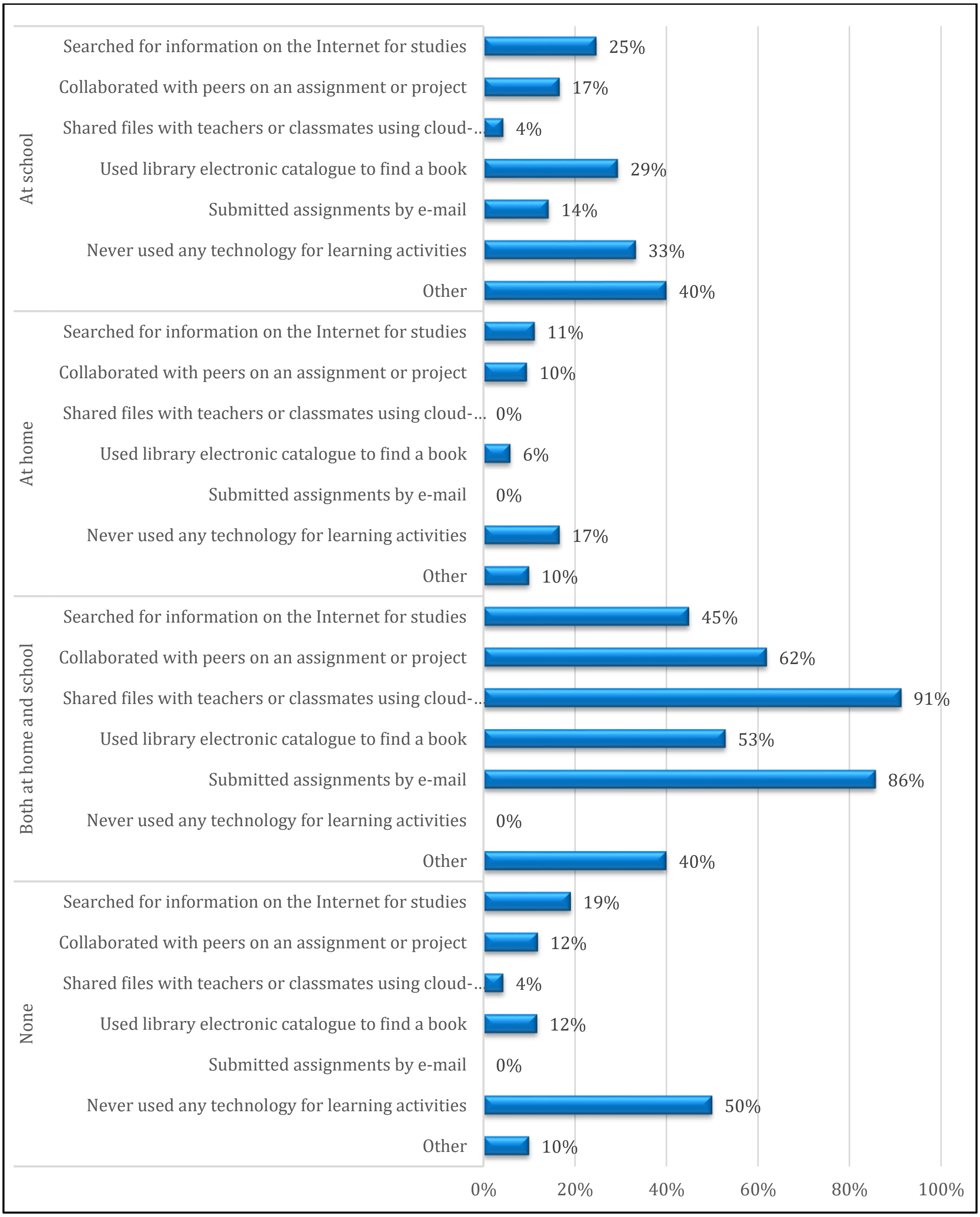

Figure 5.15: Computer access and high school learning activities

An interesting aspect was that 19% of the total percentage of students who searched for information on the internet for their studies had no computer access. These are 17 of the 20 students who did not have computer access at school or home. Also, 12% (n = 5 of the 20) collaborated with their peers on assignments or projects, 4% (n= 1 of the 20) shared files using cloud-based storage, 12% (n = 2 of the 20) used an electronic library catalogue while 10% (n = 3 of the 20) never used any technology for learning activities. These three were the two who had no technology (computer, smartphone and internet) access at home and the one who had access to only a smartphone at home. In addition to that, of the 17 who searched for information on the internet, 12 had access to smartphones, three indicated that they accessed the internet at school, and one each accessed the internet from a public library and internet café respectively. The above reveals that these 12 participants used smartphones to search information on the internet. The same applies to collaboration: two participants used smartphones (one at home and one at school), two accessed the internet at school and one at an internet café. This implies that although some students did not have computer access, they improvised to undertake their learning activities.

Use of technology for leisure or personal activities

In addition to learning activities, students were asked to indicate what other activities they used technology for during their leisure time, while they were at high school (Appendix A, Question 11). Respondents were required to tick all the activities that were applicable to them. They were also asked to specify any additional technology-based leisure activities they carried out, that were not in the provided list. The data reveals that students primarily shared digital content files (techno-cognitive practice).

With respect to the courses that students enrol for at university, a higher percentage of Commerce students than Humanities students generally used technology for their leisure activities (Figure 5.16).

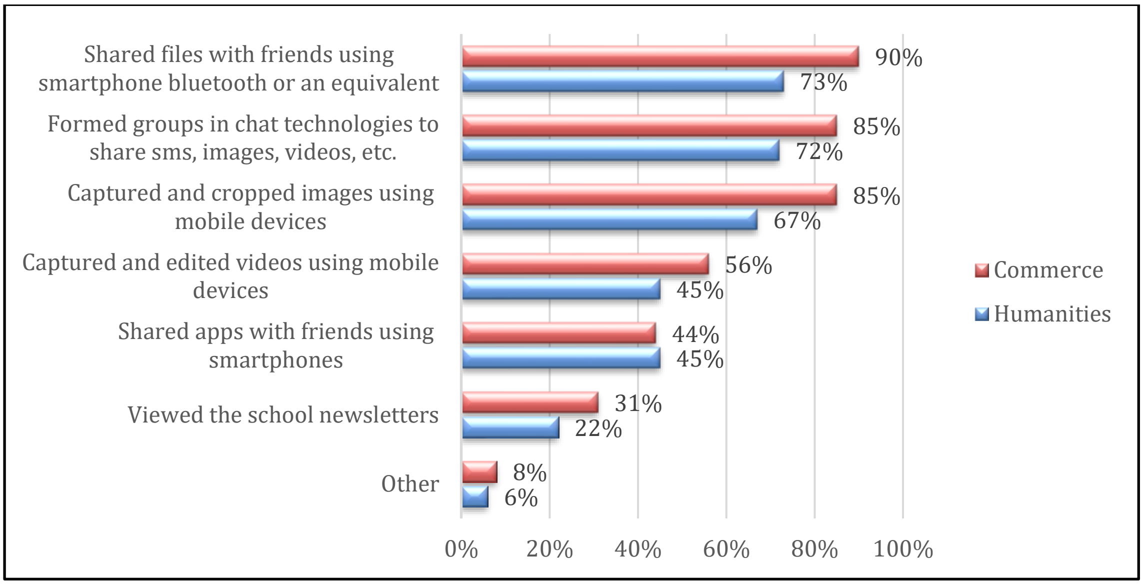

Figure 5.16: Students' use of technology for leisure activities while at high school and their university disciplines

A higher percentage of Commerce students than Humanities students shared files with friends via Bluetooth or an equivalent, using smartphones (90%); formed groups in chat technologies where they shared sms, images, videos, etc. (85%); captured and cropped images using their mobile devices (85%); captured and edited videos using their mobile devices (56%); and viewed their school newsletters (31%). There was no statistical difference between students in the two courses with respect to sharing applications with friends using smartphones.

In terms of students' age, there are noticeable differences between most of the leisure activities (Figure 5.17).

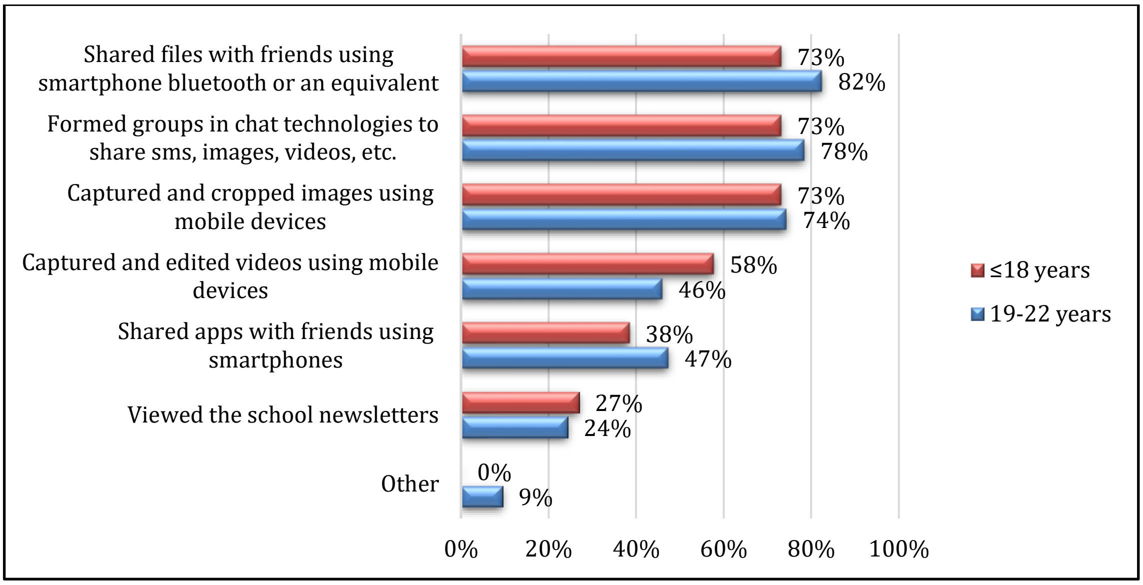

Figure 5.17: Age and use of technology for leisure activities while at high school

A higher percentage of those between 19 and 22 years old shared files with friends using Bluetooth technology (82%); formed groups in chat technologies (78%); shared applications with friends (47%); and conducted other activities that are listed above (9%), when compared to those 18 years or younger. However, a higher percentage of those 18 years old or younger captured and edited videos (58%) and viewed school newsletters (27%) when compared to those between 19 and 22 years old. There is no noticeable difference in terms of capturing and cropping of images between the two age groups and no significant difference was found between age and leisure activities, overall.

Regarding gender, a noticeable difference is observed in terms of sharing files and applications, capturing and editing of videos, and viewing of school newsletters (Figure 5.18).

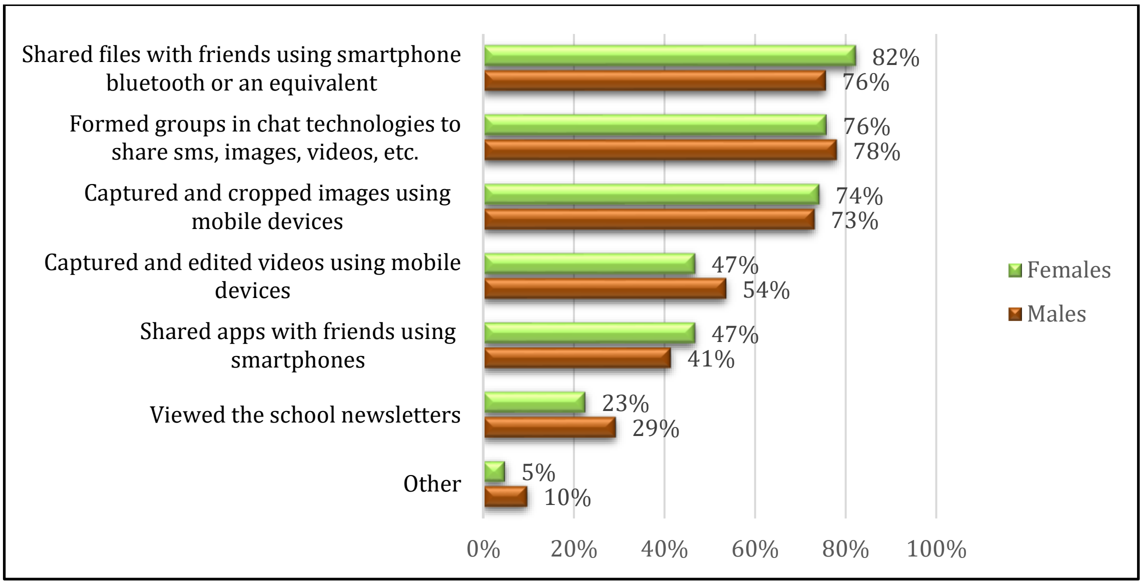

Figure 5.18: Gender and use of technology for leisure activities while at high school

The data reveals that a higher percentage (82%) of females than males (76%) shared files with friends using smartphone Bluetooth technology or equivalent. Likewise, with the sharing of applications using smartphones, 47% of females and 41% of males shared applications with their friends. However, a higher percentage of males captured and edited videos (54%) and viewed school newsletters (29%) when compared to females. There is no noticeable difference in terms of image capturing and cropping. Additionally, more males were engaged in other leisure activities than females. No correlation was found between gender and leisure activities, irrespective of the noticeable differences.

5.3.3 Enrolment for computing or equivalent subjects

Related to students' use of technology while studying at high school, it was interesting to ascertain whether the students had ever enrolled for any computing-related subject and for which computing or equivalent subjects they were enrolled (Appendix A, Question 12). The data reveals that only 20 of the participants had enrolled for computing-related subjects at high school. Of the 78 respondents who had computer access, only 19 had enrolled for a computing-related subject, including generic computer training, such as computer literacy, information computer technology and the international computer driving license (ICDL) at high school. In addition to that, one of the 20 who had no computer access had, somewhat surprisingly, enrolled for a subject that taught video production (Table 5.2).

Table 5.2: Computer access and enrolment for computing subjects

Computer access	Students enrolled for computing subjects at high school	Total
At school		**3**
	Computer Applications Technology (CAT)	2
	Programming	1
Both at home and school		**16**
	Generic computer training and Computer Applications Technology (CAT)	13
	A subject that taught video production and/or website design	2
	Computer Applications Technology (CAT) and Programming	1
No computer access		**1**
	A subject that taught video production	1

None of those students who accessed computers only at home, had enrolled for a computing-related subject. Furthermore, the student who enrolled for a subject that taught video production also indicated that he had neither computer nor smartphone access, implying that he only accessed technology devices during the video-production lessons. Overall, the above illustrates that first-year students may have minimal or no formal computing experience when they enrol at university.

Enrolment in a computing-related subject and learning activities

It was of interest to explore whether student enrolment in a computing-related subject would influence the learning activities that students undertook at high school. As I had assumed that exposure to computer-related subjects could influence student digital literacy practices, in terms of their learning activities at high school or later on at university, the data reflects that more of the students who had enrolled for computing-related subjects than those who did not do so, used technology for their high school learning activities (Figure 5.19).

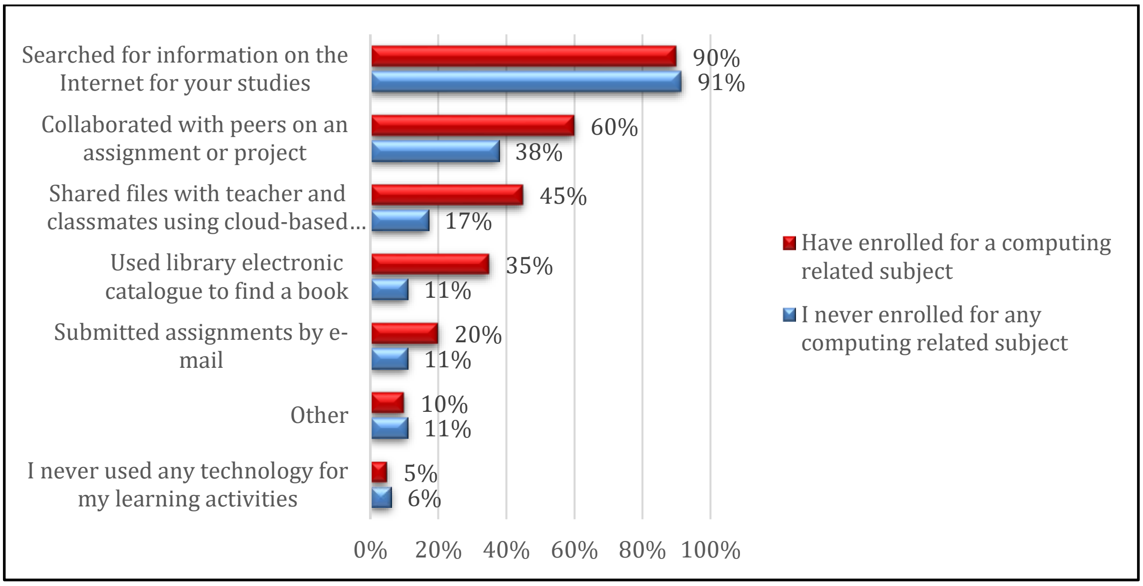

Figure 5.19: Student enrolment in a computing-related subject and high school learning activities

In descending order, students searched for information on the internet for their studies, collaborated with peers on assignments or projects, shared files with teachers or classmates using cloud-based storage, used a library electronic catalogue to find a book, submitted assignments by e-mail and conducted other learning activities while at high school. There was a significant correlation between enrolment in a computing-related course and technical practices, such as using a library catalogue ($p < 0.05$), submitting assignments by e-mail ($p < 0.05$) and sharing files using cloud-based storage with teachers or classmates ($p < 0.05$). This suggests that students may have acquired these three technical practices as part of the computing-related subjects. However, students may have learnt digital literacy practices such as searching for information on the internet for their studies (techno-cognitive) and collaborating with peers on assignments (cognitive and social-emotional), through other means; not merely formal courses. It was somewhat surprising that the respondent (1 of 20 or

5%) who enrolled for a subject that taught video production did not use any technology for learning activities. This implies that exposure to computing-related subjects did not necessarily motivate this student to use technology for learning activities, more especially that he did not have technology access while at high school. It was also sobering to note that five respondents neither enrolled for a computing-related subject nor used any technology for their learning activities, because this implies that these students used technology for learning for the first time when they enrolled at university.

Enrolment in a computing-related subject and disciplines, age and gender

With respect to the courses that students enrolled for at university, 18% (n = 7) of Commerce students and 20% (n = 13) of Humanities students enrolled for computing-related subjects while at high school. In terms of age, 19% (n = 5) of those students who were 18 years or younger and 19% (n = 14) of those between 19 and 22 years old enrolled for computing-related subjects while at high school. Additionally, a higher percentage (22% or n = 9) of male students than female students (18% or n = 11) enrolled for computing-related subjects while at high school. No correlation was found with either age or gender and enrolling for a computing-related subject.

Enrolment in a computing-related subject and leisure activities

The data reveals that more of those students who enrolled in computing-related subjects, engaged in technology-based leisure activities (Figure 5.20).

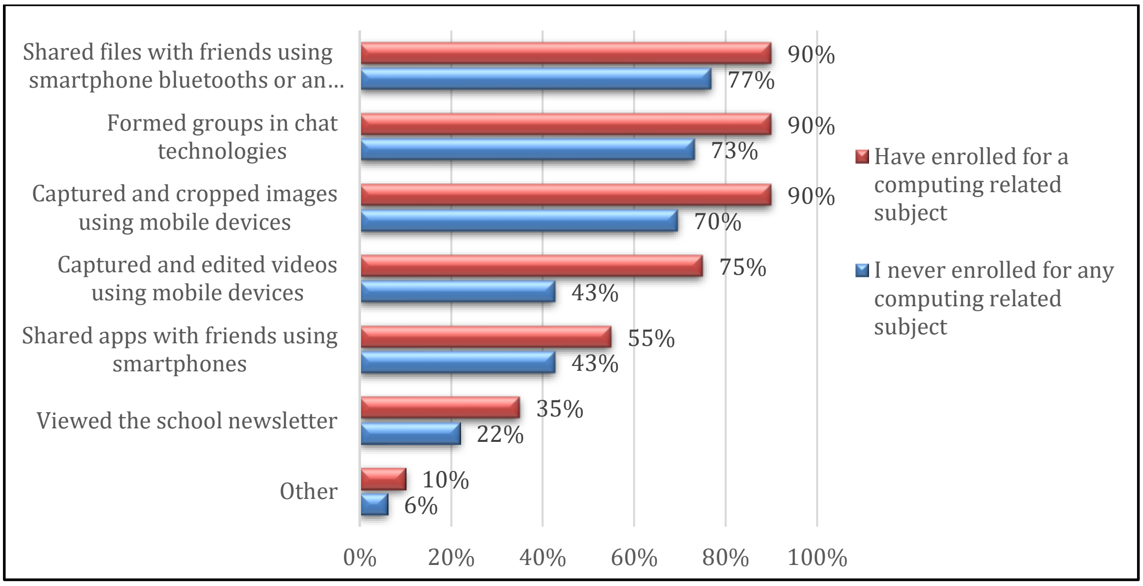

Figure 5.20: Student enrolment in a computing-related subject and student leisure activities while at high school

A higher percentage of those students who enrolled for a computing-related subject also engaged in technology-based leisure activities. A Chi Square test revealed a significant correlation ($p < 0.05$) between enrolment in a computing-related subject and the technical practice of capturing and editing videos using mobile devices.

In summary, students had varying technology experiences by the time they enrolled at university. Student access to the internet and experience in technical practices, such as using an electronic library catalogue, submitting assignments by e-mail, sharing files using cloud-based storage with teachers or classmates, and capturing and editing videos using mobile devices are influenced by gender and enrolment in a computing-related subject whilst at high school. Additionally, the techno-cognitive practice of searching for information on the internet, for studies is influenced by gender and age (Figure 5.21). That is, younger and female students were more positive in searching for information on the internet, for their studies when compared to the older and male students. This could be related to the fact that the younger students had better access to technological devices and the internet, both at home and school. At the same time, female students had better internet access than male students.

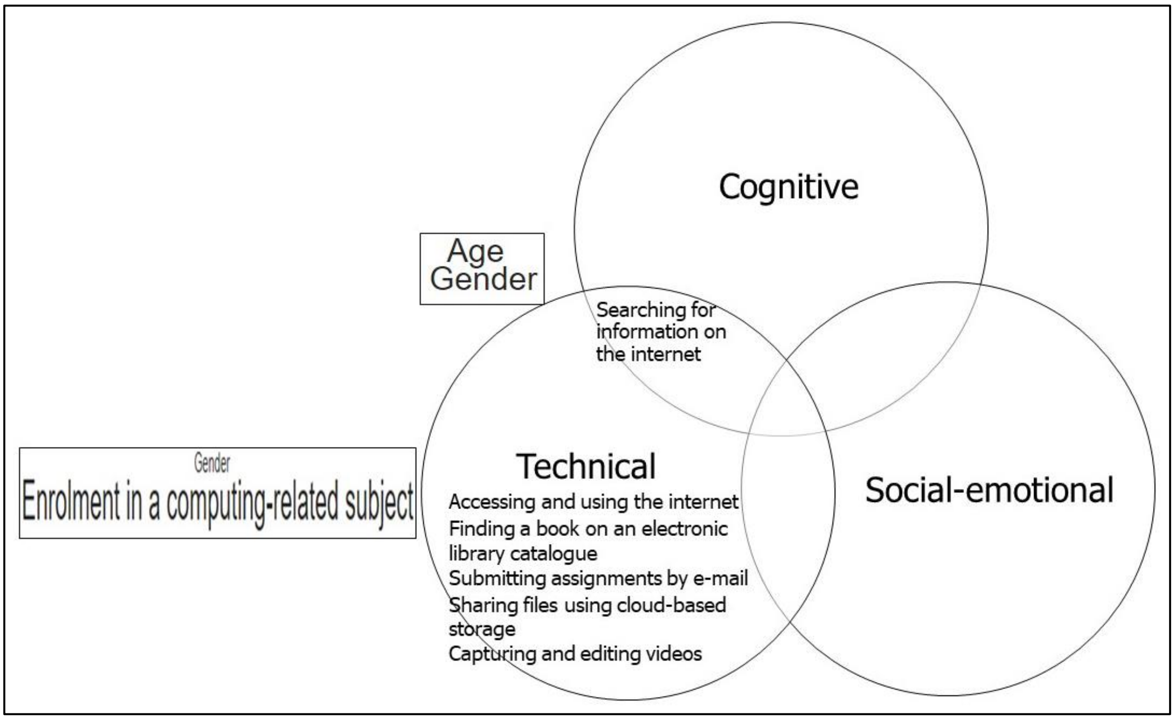

Figure 5.21: Factors influencing student use of technology for learning and leisure activities while at high school

The next sections present student digital literacy practices while they are studying at university.

5.4 Student digital literacy practices at university

This section provides a quantitative and qualitative description of student digital literacy practices at university and continues to use the three dimensions (technical, cognitive and social-emotional) of the digital literacy practices' framework to present student university digital literacy practices. These practices include both study- (discipline specific) and personal-related practices.

5.4.1 Technical dimension of digital literacy practices

Digital literacy practices in this dimension are presented below. These include accessing and using technological devices, internet connectivity and software at university (Figure 5.22).

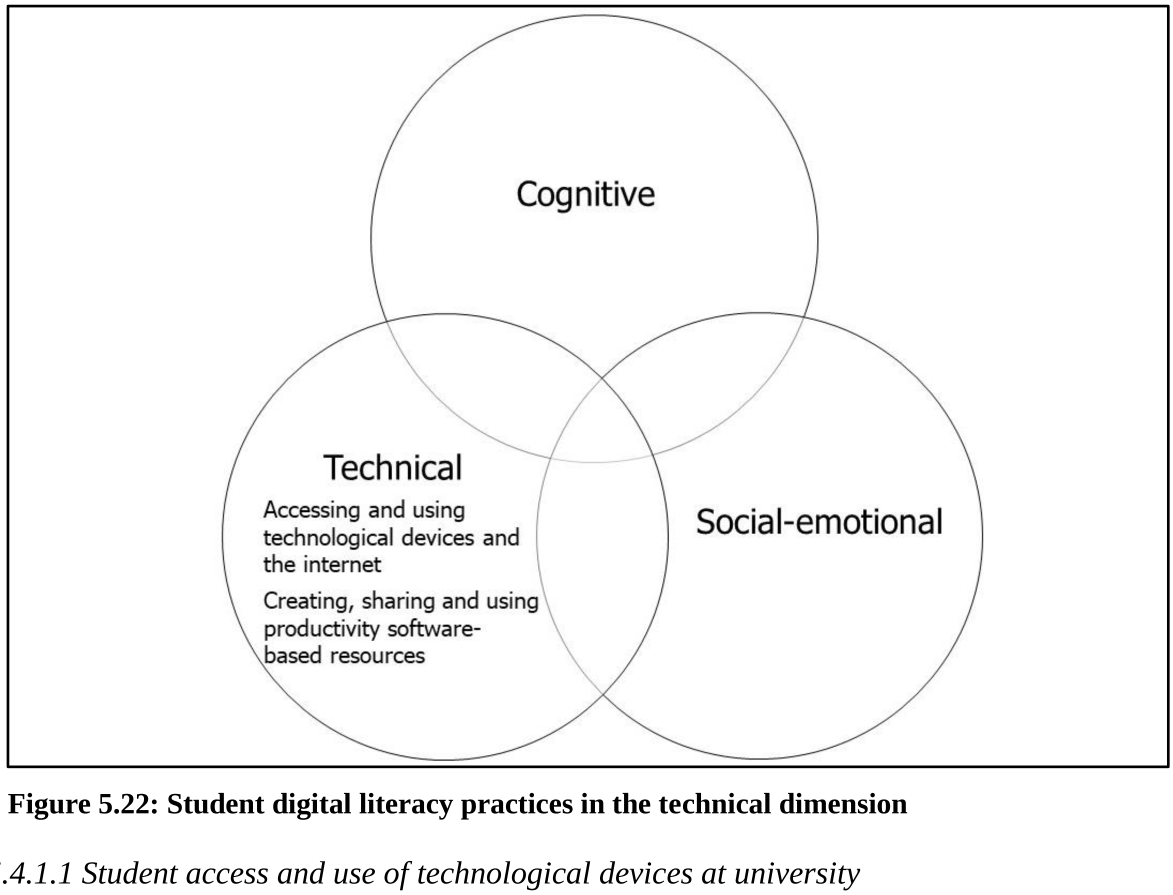

Figure 5.22: Student digital literacy practices in the technical dimension

5.4.1.1 Student access and use of technological devices at university

Participants were asked to indicate which devices they used most frequently to access the internet (Appendix A, Question 14). Participants were allowed to tick all options (laptop, desktop, tablet, mobile phone and iPad) that were applicable to them. Participants were also asked to indicate who owned each of the devices (Appendix A, Question 14). Tablets and iPads were singled out in the questionnaire, but because in the data, 65 students (20 –from Commerce and 45 from Humanities) ticked tablets, eighteen (9 from each course) ticked both tablets and iPads, and only two (1 from each course) ticked iPads, I have grouped tablets and iPads (to make 67 in total) in the analysis. It is extremely unlikely that the 18 students had owned both devices particularly because the Humanities students received tablets from the university as they did not have access to any other device that they could use for study purposes.

The data reveals that the most commonly used device was the mobile phone (smartphone) (86% or n = 89) and the least was the Tablets/iPads (65% or n = 67) (Table 5.3).

Table 5.3: Owner of device used by students

Owner of device	**Smartphone**	**Desktop**	**Laptop**	**Tablet/ iPad**
Me	84	6	42	44
University	3	50	11	11
Family member or friend	2	2	8	10
Public place (internet café, Public library)	0	0	2	1
Two or more owners (Appendix J, Table 1)	0	16	10	0
Other	0	0	0	1
Grand Total	**89**	**74**	**73**	**67**

The quantitative data also reveals that, of the total of 103 respondents, 16 used five (all) devices; 26 used four devices; 31 used three devices; 18 used two devices where six used the university desktops and a mobile device, while 12 used two mobile devices; nine used one device, whereas only three used the university desktops, one used a laptop, two used a(n) tablet/iPad, three used a smartphone; and three had no access at all. These three might have misunderstood the question. Concerns may arise regarding those who only used university desktops because this means these students are limited to only accessing the internet on campus. This implies that they may be unable to engage with the internet-based learning activities off campus. For instance, one Commerce student reported that some group members could not contribute to their groupwork because they only had access to the university desktops:

Participant: Yes, because we had it on one laptop and some people didn't have laptops
Researcher: So that means that they did not comment?
Participant: No, they had to go to the labs to comment on the Google document but then when they were at home, they couldn't contribute
Researcher: They didn't have any laptops?
Participant: Yes
Researcher: And they didn't have smartphones?
…
Researcher: You were saying they didn't have smartphones either?
Participant: Yes, some of them didn't [Commerce, G2, line 267-273; 288-289]

The most worrying for course lecturers or convenors is that if students do not have access to any technology, they cannot all participate in any computer-based learning activities off-campus.

The participants were also asked who owned the devices that they used to access the internet. They indicated that they either owned the devices or accessed devices owned by the university, a public library, internet café, cafeteria/restaurant/shopping mall or family member or friend (Table 5.3). Eighty-two percent of the students owned smartphones, 3% used smartphones owned by the university and 2% used smartphones that belonged to a family member or friend. I suspect that the 3% who indicated that they used university smartphones did not understand the question or may have inserted their own sim cards in tablets provided by the university, as the university does not provide students with smartphones. Furthermore, participants mainly used desktops owned by the university, meaning that participants accessed them when they were on campus or in their residences. For instance, a Humanities participant reported that she used a computer laboratory at her residence. Also, 6% of the students primarily used their own desktops while 2% used desktops that belonged to a family member or friend. Desktops at public libraries and internet cafes were also used. Also, a large number of laptops were owned by the participants while they also used laptops at other locations. The same applied to tablets/iPads; they were primarily owned by the participants. Thirty-nine Humanities participants ticked either 'Me' or 'University' because they received the tablets as part of the personal mobile device project at the university. I am not sure why three of the 20 Commerce participants indicated that the tablets belonged to the university. I am, however, aware that the university Information and communications services (ICTS) department rents out ICT equipment[17]. Other reliable

[17] http://www.icts.uct.ac.za/rent-equipment

owners of the tablets used by participants were family members or friends. Furthermore, one participant used a tablet owned by a public library and internet café, while one used a tablet owned by an unspecified owner.

The majority of students in both courses primarily used smartphones to access the internet (Figure 5.23).

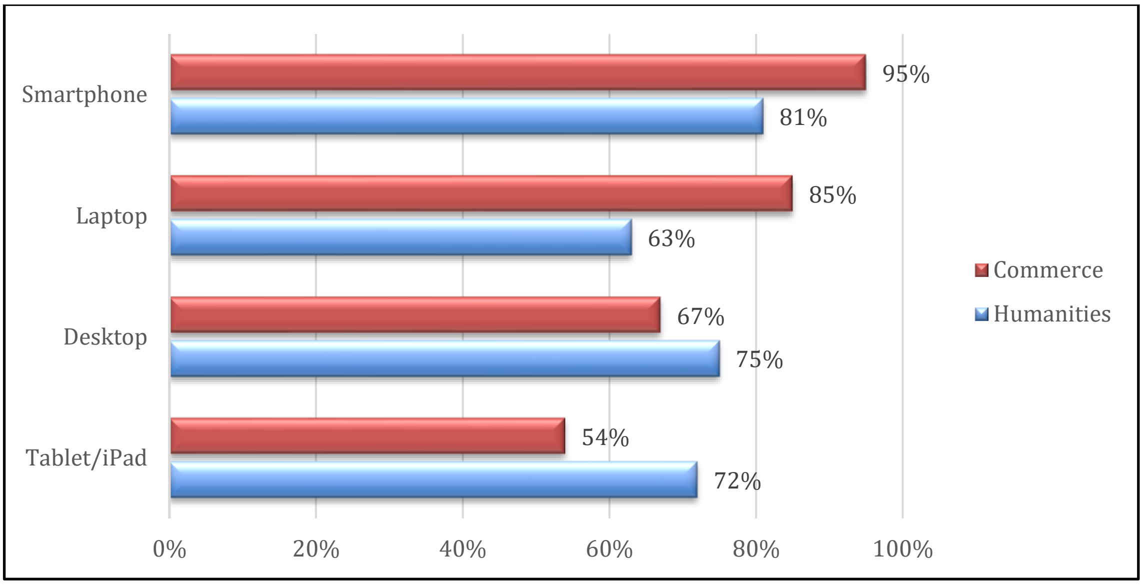

Figure 5.23: Disciplines and device access at university

There were variable differences between the students from the two courses in terms of device access and ownership. On one hand, higher percentages of Commerce students accessed smartphones (95%) and laptops (85%) than Humanities students. On the other hand, higher percentages of Humanities students accessed desktop computers (75%) and tablets/iPads (72%) when compared to those from Commerce. That is, the Commerce students primarily accessed their own smartphones and laptops while Humanities students primarily accessed desktop computers owned by the university and also tablets provided by the university. A Chi Square test also confirmed a significant correlation between being a Commerce student, and smartphone access ($p < 0.05$) and laptop access ($p < 0.05$).

In terms of age, both age groups primarily used smartphones to access the internet (Figure 5.24).

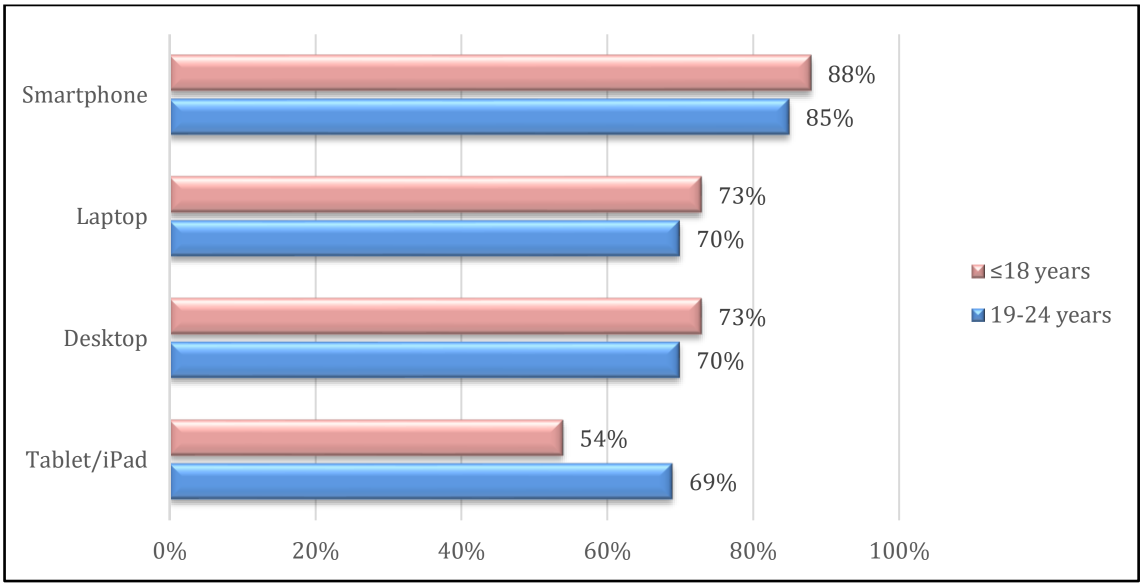

Figure 5.24: Age and technology access at university

There is a noticeable difference between the two age groups in terms of tablets/iPads, with a higher percentage of those students between 19 and 22 years old using tablets/iPads (69%) when compared to those who were 18 years old or younger (54%). However, no correlation was found between student age and their device access.

In terms of gender, both females (92%) and males (78%) most frequently used smartphones to access the internet, as compared to other devices (Figure 5.25).

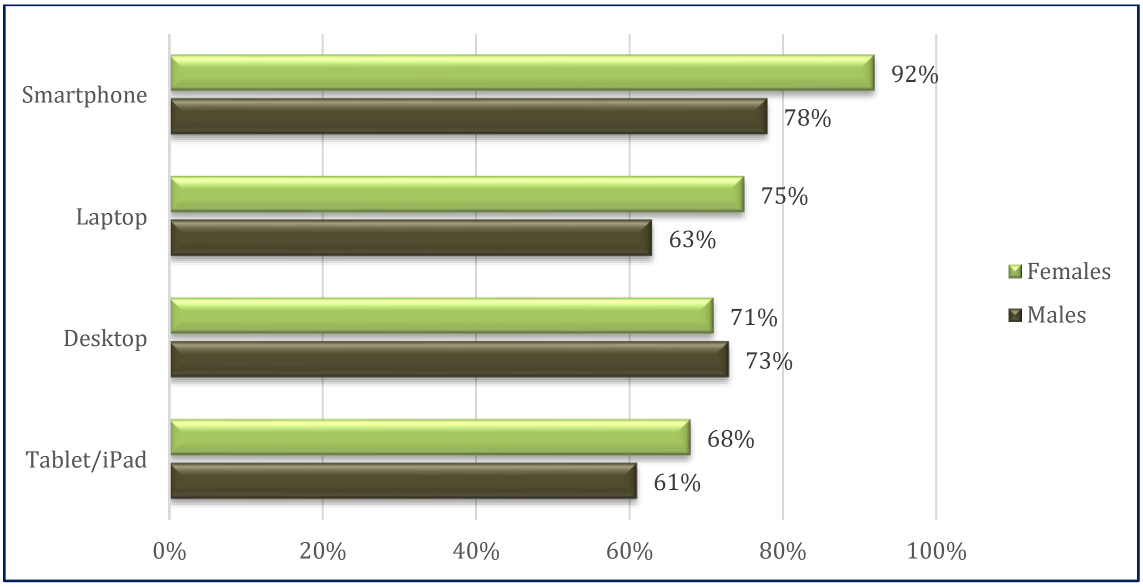

Figure 5.25: Gender and technology access at university

Generally, female students had better technology access than male students at university and there was a positive correlation between being female and having smartphone access ($p < 0.05$).

5.4.1.2 Student access to internet connectivity at university

Participants were asked to indicate the location from which they accessed the internet (Appendix A, Question 13). They were allowed to tick all the options (home, university, public library, internet café, cafeteria/restaurant/shopping mall, family member or friend's place, other) that were applicable to them. Their responses indicated that they accessed the internet from various locations such as the university (97%, n =100), from home (67%, n = 69), a public library (60%, n = 62), cafeteria/restaurant/shopping mall (56%, n = 58), internet café (49%, n = 50), or family member or friend's place (47%, n = 48). Participants also had to indicate the type of internet connection they used at each location (Appendix A, Question 13).

Options included high speed cable, slow speed cable (which have been combined in Table 5.4), dial-up (modem), wi-fi (hotspot), 3G/4G and Other (they were asked to specify).

Table 5.4: Location of internet access

Internet connectivity	At the University	At home	Public library	Cafeteria/ restaurant/ shopping mall	Internet cafe	Family member's or friend's place	Total
Wi-fi (Hotspot)	69	14	38	37	25	11	**194**
3G/4G	1	31	5	11	3	23	**74**
High or low speed cable	13	7	11	4	17	5	**57**
Dial-up (modem)	0	0	0	0	0	4	**4**
Two means of access	12	14	6	3	5	3	**43**
Three or more means of access	5	2	0	0	0	0	**7**
Other	0	1	2	3	0	2	**8**
Grand Total	**100**	**69**	**62**	**58**	**50**	**48**	

At the university, all participants but one connected to the internet using high or slow speed cables and/or wi-fi. At the same time, five Commerce students and one Humanities student made use of 3G/4G in addition to the university internet connection, while the one participant (from Humanities) used 3G/4G to connect on campus. Based on the responses from other students where almost all of them used the university wi-fi connection, this participant may have misunderstood the question.

When students were asked who owned the technology that they used to connect to the internet (Appendix A, Question 14), they indicated that it was owned by them, a family member or friends, the university, public library, cafeteria/restaurant/shopping mall (see Table 5.4). It was also counter-intuitive to find that some of them used their 3G/4G sim cards or data cards while they were at a public library (5), internet café (4), cafeteria/restaurant/shopping mall (10) and family member or friend's place (22), because the assumption was that students would visit these locations to connect to the internet. The data shows that ±50% of participants have internet connectivity even when they are off-campus, with the most reliable point being home (67%, n = 69), followed by a public library (60%, n = 62) and cafeteria/ restaurant/shopping mall (56%, n = 58). At the same time, the quantitative data reveals that 15% (n = 16) of the participants did not have internet access when they were off-campus. These were the respondents who have chosen 'the university' as the only point of internet access.

Regarding internet access off-campus, of the 69 participants who accessed the internet from home, 42 primarily used 3G/4G followed by wi-fi hotspots (25) (see Table 5.4). This could be due to, firstly, that 3G/4G is used on mobile devices (such as the smartphones which is the most frequently used by the participants, tablets and iPads). Secondly, some students who do not have wi-fi routers used their mobile devices as wifi hotspots. For instance, two Humanities students indicated that, at home, they used their phones as wifi hotspots to connect their tablet and laptop to the internet, respectively.

It is important to note that the university residences have wifi, so the students who may be negatively affected, are those who do not live in the residences. One of those who lived in the residences reported that having wifi at the residences facilitated flexibility of learning (in terms of time and place):

> Participant: It's also easier during weekends; you don't have to take a Jammie to Upper Campus. You just wake up, take a shower and then work in your room.
> Researcher: Do you have access to the internet, as well?
> Participant: Yes, we have access to wifi [Humanities, G1, line 91-94]

However, one Humanities student shared her strategy of working around the challenge of limited internet connectivity off-campus. She reported that the internet café near her home closes at nine o'clock, and so she cannot access the internet from there by the time (around ten) she recovers from travelling fatigue and is ready to work. Also, since it was quite expensive for her to connect to the internet for an extended period at home, she saved her resources by using the wifi on campus:

> . . . it's quite a challenge because I don't have that much internet access at home like I would have here. At a certain time, I have to leave campus in order to get home so I have to save all the lecture recordings and all the resources while I have access to wifi . . . [Humanities, G2, line 155-157].

These excerpts illustrate how constraining limited internet connectivity can be for students to carry out their learning activities, but also the strategies students adopt to address this constraint.

Regarding course distribution and student internet connectivity, the data reveals that Commerce students had better internet access than those from Humanities (Table 5.5).

Table 5.5: Course and internet connectivity while studying at university

Internet connectivity	Commerce	Humanities
At home	72%	64%
Family member's or friend's place	56%	41%
At the University	100%	95%
Public library	59%	61%
Internet cafe	44%	52%
Cafeteria/ restaurant/ shopping mall	54%	58%

Interestingly, noticeable differences between the two courses were at home and the internet café; higher percentages of the Commerce students than Humanities students accessed the internet from home while higher percentage of those from Humanities accessed the internet from an internet café when compared to those from Commerce. However, no correlation was found between courses and points of internet connectivity. A possible explanation is that a higher percentage of the Commerce students than Humanities students could be using 3G/4G sim cards to access the internet on their smartphones and via laptops at home (see Figure 5.23). Alternatively, those Humanities students who do not have 3G/4G sim cards may use internet cafés to access the internet.

Regarding age and internet connectivity, those students who were 18 years or younger had better internet access than those between 19 and 22 years old (Table 5.6).

Table 5.6: Age and internet connectivity while studying at university

Internet connectivity	≤18 years	19-22 years
At home	77%	62%
Family member's or friend's place	46%	47%
At the University	100%	96%
Public library	81%	55%
Internet cafe	38%	53%
Cafeteria/ restaurant/ shopping mall	58%	57%

Significant differences were at locations such as home, public libraries and internet cafés; higher percentages of those 18 years or younger than the older ones accessed the internet from home (77%) and public libraries (81%), while a higher percentage (53%) of the older ones accessed the internet from internet cafés. Also, a significant correlation between younger students and public library access ($p < 0.05$) was found. A possible explanation of the difference in terms of internet connectivity at home, is that a higher percentage of the younger students compared to the older ones used 3G/4G sim cards (see Figure 5.24). I am not sure what influences internet access in the other two locations.

Regarding gender and internet connectivity, females had better internet access than males (Table 5.7).

Table 5.7: Gender and internet connectivity while studying at university

Internet connectivity	Females	Males
At home	69%	63%
Family member's or friend's place	50%	41%
At the University	95%	100%
Public library	63%	56%
Internet cafe	56%	37%
Cafeteria/ restaurant/ shopping mall	60%	51%

There were differences at all locations, with a variance of 19% at Internet cafés. Also, a positive correlation between being female and internet café access ($p < 0.05$) was found. Irrespective of a higher percentage (50%) of females when compared to that (34%) of males, having 3G/4G data cards (see Appendix J, Table 2), higher percentages of female students than male students still accessed the internet from locations other than their homes. The above findings suggest that it may be a limited perspective to assume that discipline, age and gender influence student access to internet connectivity, as there may be other factors such as whether one is staying on- or off-campus, or they could be associated with the type and location of internet connectivity.

Overall, findings from the TwoStep cluster analysis reveal that gender is more important than discipline and age in terms of technology device and internet access and use. This implies that female students in Commerce have better smartphones and internet access compared to male students in any of the two disciplines.

5.4.1.3 Creating, sharing and using digital resources

In the questionnaire, participants were asked to indicate what digital literacy practices they conducted using productivity software (Appendix A, Question 23). The students were asked to tick all the digital literacy practices that applied to them, such as creating own resources, sharing own resources, tagging own resources, using other people's resources 'as is' and tagging others' resources. Productivity software included Microsoft Word, Excel spreadsheets and Powerpoint presentations or their equivalents, and Google documents.

The responses demonstrated that students across both courses primarily created word-processed documents, spreadsheets, presentations and Google documents as compared to other practices, with larger percentages of creation undertaken by Commerce students (Figure 5.26).

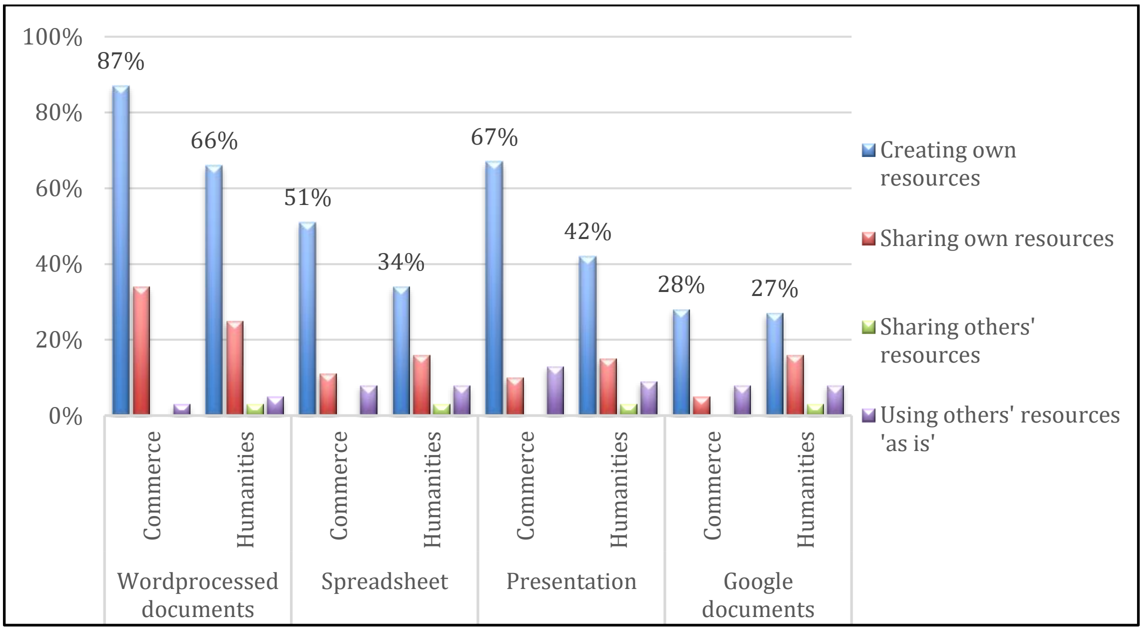

Figure 5.26: Disciplines and students' use of productivity software

In the respective order of the Commerce and Humanities courses, 87% and 66% of students created Word documents, 67% and 42% created presentations, 51% and 34% created spreadsheets, while 28% and 27% created Google documents. Also, a strong correlation between the Commerce course and the creation of word-processed documents ($p < 0.05$) and presentations ($p < 0.05$) was found. In addition to that, a higher percentage (34%) of Commerce students than Humanities students shared their own word-processed documents, which was the most highly shared resource as compared to others.

To further determine whether the use of productivity software was influenced by course requirements or not (Appendix A, Question 24), it was of interest to distinguish whether these resources were created for study, personal or both purposes (Figure 5.27).

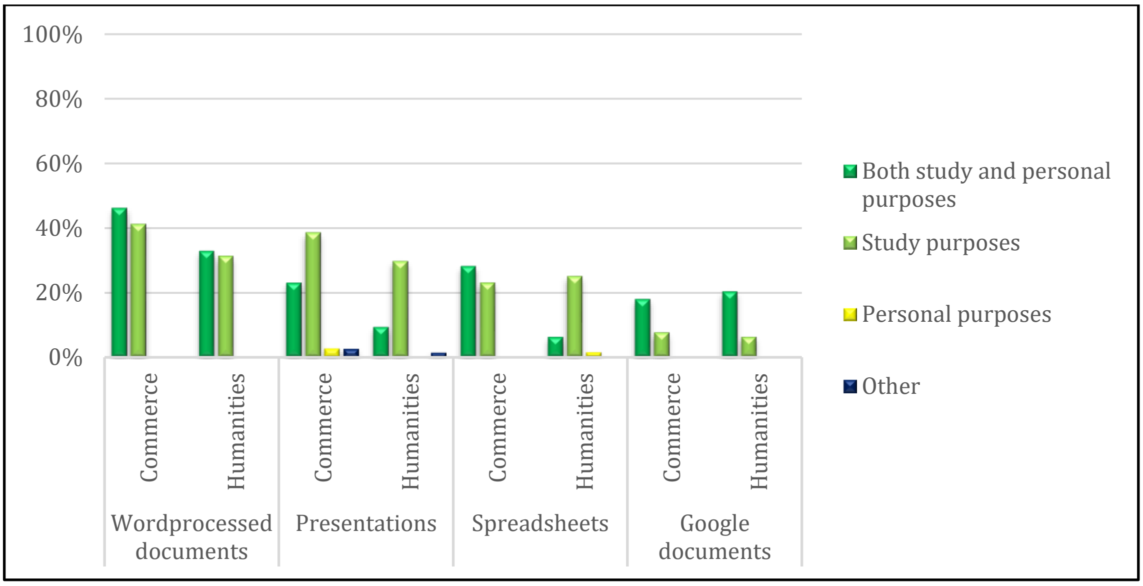

Figure 5.27: Students' purpose for creating resources using productivity software

Commerce students primarily created word-processed documents for study purposes only and spreadsheets for both study and personal purposes. Additionally, more Humanities students created Google documents for both study and personal purposes as compared to the Commerce students. None of the resources was primarily created for personal purposes. In the respective order, 3% (n=1) of Commerce students and 2% (n=1) of Humanities students created presentations and Google documents for personal purposes. The above implies that students from both courses primarily created resources for study purposes. However, it is important to note that the creation of the above-mentioned resources may also be attributed to other courses in which the students were enrolled. For instance, I am aware that Humanities students also enrol for a course, *'Quantitative literacy in Humanities'* that requires the creation of spreadsheets and Google documents – this may explain the unexpected finding that 25% of Humanities students created spreadsheets.

Regarding age, both age ranges primarily created new resources; in descending order, participants of both age ranges primarily created Word documents, presentations, spreadsheets and Google documents as compared to other practices (Figure 5.28)

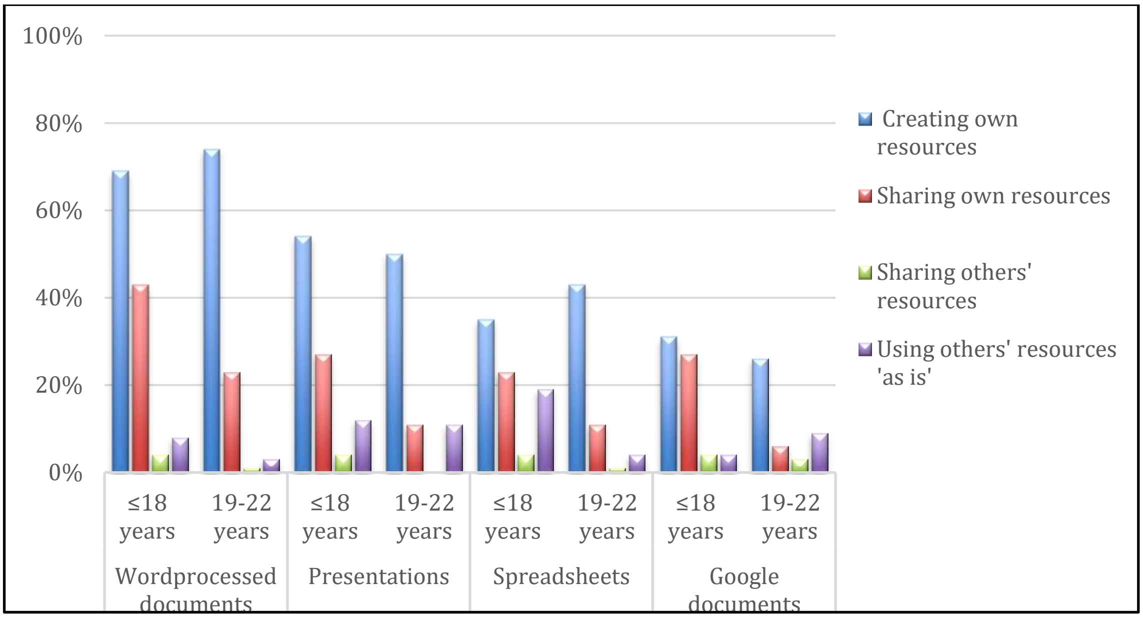

Figure 5.28: Age and use of productivity software

In the respective order of those 18 years or younger and those between 19 and 22 years old, 69% and 74% created word-processing documents, 54% and 50% created presentations, 35% and 43% created spreadsheets, and 31% and 26% created Google documents. A discernible practice for those of 18 years or younger was sharing of their own copies of word-processing documents (43%), presentations (27%) and Google documents (27%). Another noticeable practice is that a higher percentage (19%) of the 18 years old or younger participants than those between 19 and 22 years (4%) used others' spreadsheets 'as is'. Also, a correlation between age (being younger) and sharing of Google documents ($p < 0.05$) and using others' spreadsheets 'as is' ($p < 0.05$) was confirmed. Furthermore, none of the younger students redistributed others' spreadsheets, presentations or Google documents while none of the older ones tagged other people's presentations.

Regarding gender, both groups primarily created word-processed documents, spreadsheets, presentations and Google documents as compared to other practices (Figure 5.29).

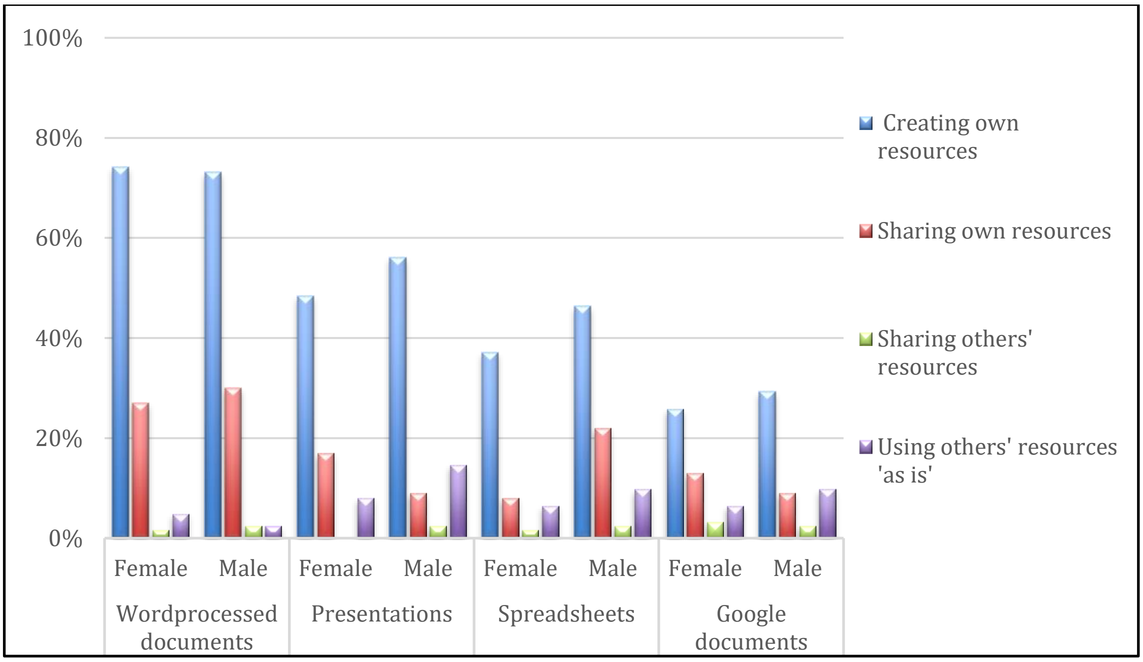

Figure 5.29: Gender and use of productivity software

In the respective order of females and males, 74% and 73% created Word documents, 48% and 56% created presentations, 37% and 46% created spreadsheets, and 26% and 29% created Google documents. Furthermore, there was no noticeable difference in how participants used the four types of productivity software. Also, the Chi Square test revealed that there was no correlation between gender and use of productivity software.

Similar to high-school learning practices, I assumed that student enrolment in a computing-related subject would have an influence on their digital literacy practices at university. The data reveals that both groups of students primarily created word-processed documents as compared to other resources (Figure 5.30).

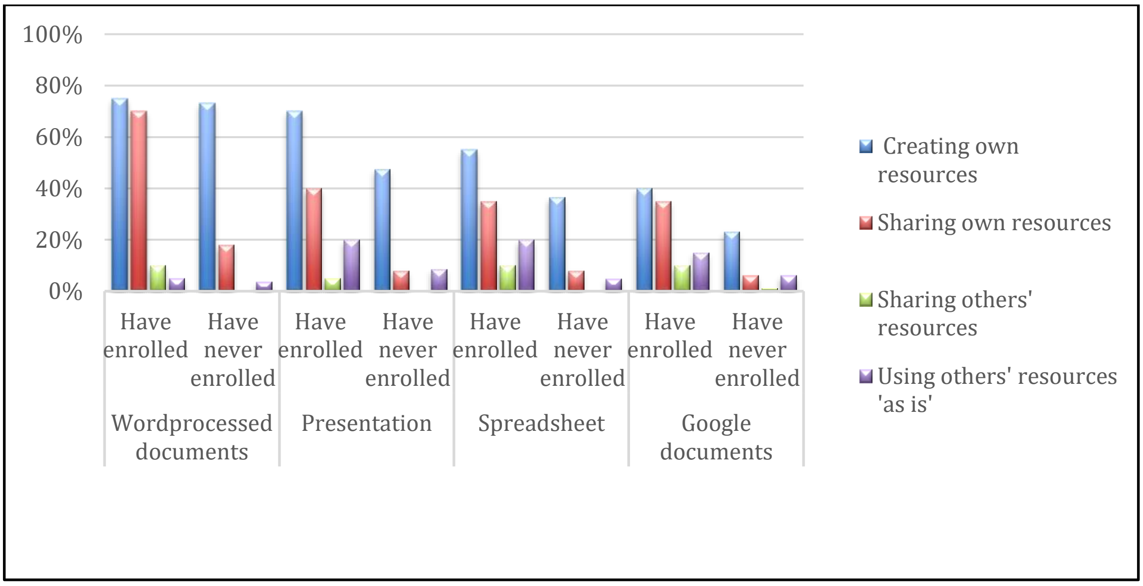

Figure 5.30: Enrolment in a computing-related subject and use of productivity software

A higher percentage of those students who enrolled for a computing-related subject than those students who did not do so, created word-processed documents (75%), presentations (70%), spreadsheets (55%) and Google documents (40%), and shared word-processed document (70%). A Chi Square test revealed that there is a significant correlation ($p< 0.05$) between enrolling in a computing-related subject and sharing one's own copy of word-processed documents, presentations, spreadsheets and Google documents; and sharing other people's copies of word-processed documents and spreadsheets.

Overall, findings reveal that the discipline influences the creation of word-processed documents and presentations (Appendix L). Additionally, the TwoStep cluster analysis suggests that enrolment in a computing-related subject is more important than discipline and age in terms of sharing and using word-processed documents, presentations, spreadsheet and Google documents.

5.4.2 Cognitive dimension of digital literacy practices

Digital literacy practices (common to both disciplines) in the cognitive dimension include identifying the need for information (see Section 5.5.1.2 and 5.5.2.2), knowledge of and understanding copyright and alternative mechanisms of licensing resources, such as Creative Commons, evaluating information, and synthesising and communicating information (see Section 5.5.1.2 and 5.5.2.2). Figure 5.31 illustrates these cognitive practices.

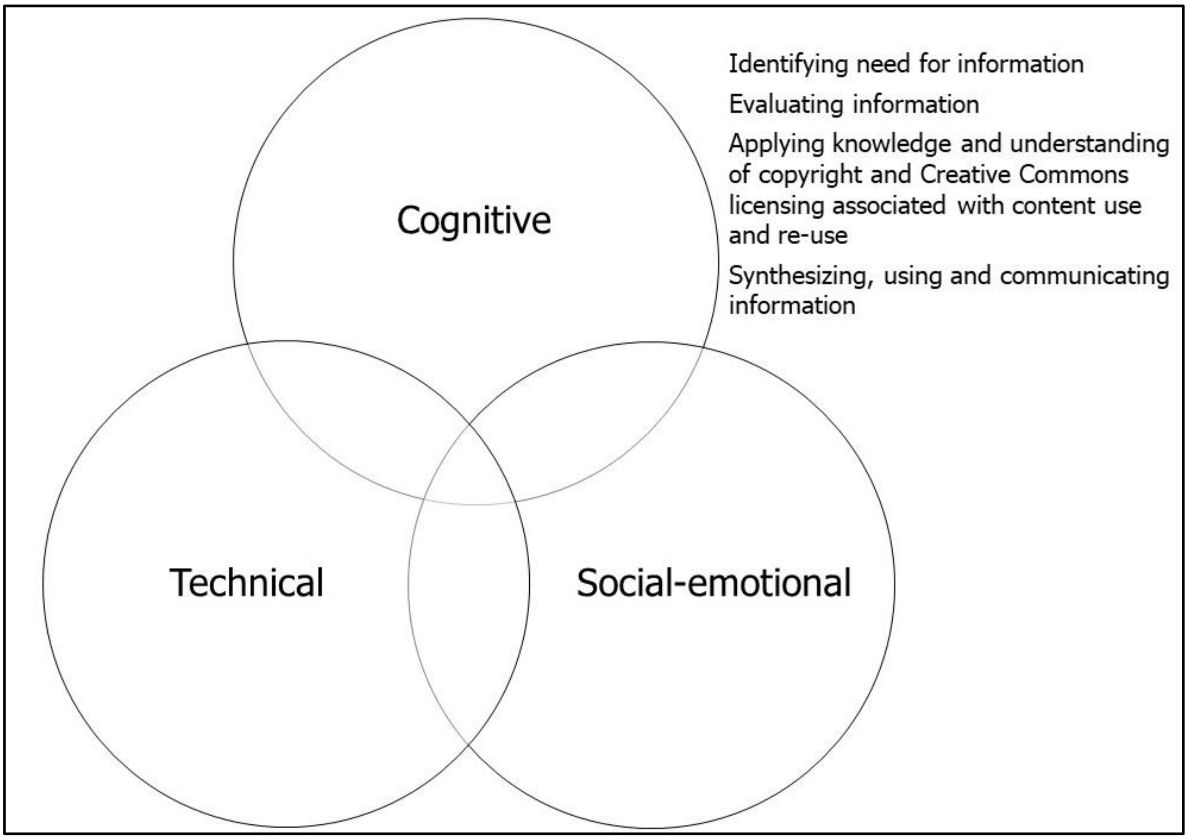

Figure 5.31: Student digital literacy practices in the cognitive domain

5.4.2.1 Knowledge and understanding of intellectual property licensing mechanisms (such as copyright and Creative Commons) and licensing of resources

As mentioned in Chapter 2, student use of openly licensed materials, such as OER, is an emerging phenomenon in the South African HE context. Therefore, it is of interest in this research to find out about students' knowledge and understanding about legal issues surrounding access to and use of information and media resources, more so, the openly licensed resources.

(i) Awareness of copyright and licensing of resources

When participants in the focus groups and interviews were asked whether they were aware of any intellectual property (IP) mechanism licencing (such as copyright), the responses illustrated uncertainty about their knowledge of licences attached to the resources they were using for either learning or personal purposes. The excerpts below demonstrate that some respondents from both courses were unaware of licencing aspects while some had different conceptions of licencing. For instance, one student said that she was unaware that pictures had licences:

> I didn't know that there are some licences attached to images. I know with content that if you copy and paste something, you have to reference it. With images, they usually just download [Commerce, G3, line 267-269] [other participants laughing].

Another student from Commerce who had used images prior to this course's activities seemed to understand a little more about copyright and the consequences of infringement. He said:

> I understand that … some images are copyright . . . so to copy them, you need to get copying rights from someone else. That's all I know. … We are aware that some images, … if you just take them … and someone catches you, then you are in trouble [Commerce, G3, line 262-265].

However, he further expressed his uncertainty about identifying licences:

> . . . I am sure I have copied a lot of images that I shouldn't have copied. Sometimes I wouldn't know, . . . I would see a nice image and just copy it [Commerce, G3, 285-286].

Regarding other resources such as YouTube videos, another student from Commerce who had observed her friend remixing music pieces was aware of copyright pertaining to music:

> I'm aware of one licence; I know on YouTube, you cannot upload a video with other songs in it . . . songs that are copyrighted . . . like if you make a video yourself and you want to add one of the popular videos as the background, you can't use it because you don't have copyright to that piece of music . . . that's all I know [Commerce, G2, line 303-306].

Furthermore, two of the three students from Humanities, who indicated that they had created music pieces, were quite confident about remixing music pieces and using the remixed piece because they understood that to be a social practice (they referred to radio remixed music pieces).

When asked whether they uploaded their music pieces onto YouTube, one was clearly unaware of the IP laws governing music:

> When doing music, . . . when you do a mix tape . . . you are using somebody's instrumental so you don't ask for permission, you just take it and make your own music . . . Not specifically, uploading on YouTube but you play your music everywhere [put it onto a CD, USB, etc.] . . . It's a mixed-taped; you take somebody else's bit and remix it [Humanities, G1, line 203-212].

However, these students demonstrate unawareness of the legal requirements to music remixing practices. Hence, they do not understand the illegality of their practices and repercussions. When asked whether they were aware of any YouTube restrictions regarding remixing other people's copyright content and uploading it as theirs, another student responded as follows:

> I didn't know about that….. But last week, when I was uploading videos, I realised that someone asked for permission to use someone's instrumental to do a cover and I was like, 'Do you need to ask for permission?' And then I realised that you must ask for permission [Commerce, G1, line 193-198].

The last sentence in the above excerpt demonstrates that the student became aware about the need to seek permission; hence, it can be hoped that he will do so too.

Additionally, although one of the Humanities participants reported that they were informed through a workshop on copyright aspects while she was at high school, and demonstrated knowledge of copyright issues related to books (during the focus-group discussion), she was not accustomed to applying them to YouTube videos. She indicated that she only knew about age restrictions of YouTube videos.

Furthermore, two students expressed that they believed that they could re-use any digital resource to which they had access, as they wished. The one from Commerce said:

> I don't know how that works . . . to me, my understanding is that when they put up their videos out there, they make them available for anyone to share so I don't have to get permission from the producer . . . I don't know how it works, that is my own understanding [Commerce, Interview, 259-262].

The second one, from Humanities, asked: "Why are you sending it out if you don't want people to use it?" [Humanities, G3, line 316]. These participants' responses indicate the illogicality of placing restrictive licences on materials that are clearly intended to be shared. The above discussions demonstrate students' limited understanding about resource licencing.

(ii) Awareness of Creative Commons licences and open educational resources (OER)

When students were asked for how long they had been aware of IP licencing mechanisms alternative to full copyright, 5% from Humanities said they had known for a semester, 15% and 13% from Commerce and Humanities respectively said they had known for three months and 59% and 48% respectively had never been aware of any alternative licencing mechanisms (Figure 5.32).

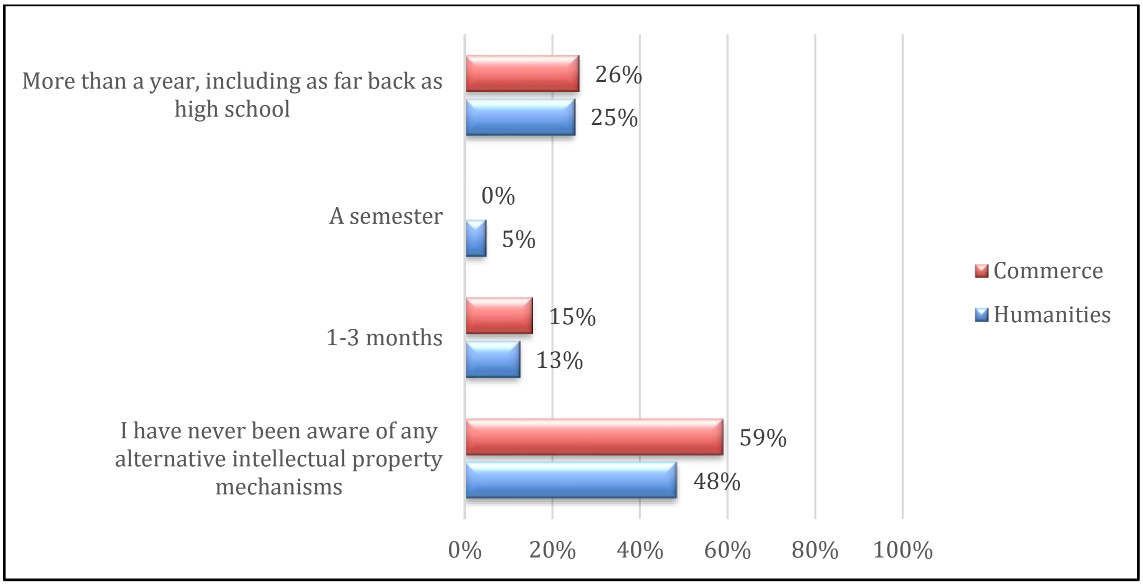

Figure 5.32: Disciplines and student awareness of licences alternative to copyright

This data indicates that there is limited student awareness about IP licencing mechanisms alternative to full copyright.

During qualitative data collection, when students were asked whether they had been aware of any open licencing alternative to copyright, all respondents said that they knew nothing about Creative Commons licencing. Although one of the Commerce participants was unaware about open licencing, her conception of openness was based on the availability of freely shared resources:

> Participant: … I have been using Khan Academy.
> Researcher: Hmm, that's nice . . . that's an open content repository.
> Participant: Ja.
> Researcher: All the stuff in there is openly licensed.
> Researcher: So, you were aware those are open educational resources?

> Participant: Well, I assume because they have a lot, they have them for different courses. For instance, they have Economics, Microeconomics, Maths, Physics, whatever it is and also quite a few resources from different faculties so I was assuming it's really free so . . .
> Researcher: As in open . . . what would your definition of open be?
> Participant: Access to everyone without having to pay; you can actually, watch it, ja . . . [Commerce, G3, line 366-375]

When students were probed whether they had never noticed the 'CC' attributions on the resources that they used for learning, one of the Humanities respondents who had used Khan Academy said: "Maybe, in my case, I wouldn't even see it, . . . even if it was written in big because . . . I wasn't looking for it" [Humanities, G2, line 275-276]. On the contrary, the Humanities interviewee who said she may have seen the 'CC' had a different understanding about CC licencing because, firstly, she associated CC licencing with digital resources only and, secondly, she thought that CC represented 'Close Corporation':

> Researcher: You have never heard of any open educational resources?
> Participant: No, . . . I am not one for online, I just don't bother there . . . I just go for physical copies.
> Researcher: Hard copies too, may be open educational resources. Have you ever noticed this CC for Creative Commons licences [Researcher *showing student an example of a copy with the CC licence*]
> Participant: I did Business so every time I see that, I assume CC is for Close Corporation; when I see words in front of CC, I assume that it's a company's name.
> Researcher: On reading material?
> Participant: Yes, because a company's name always stands with the CC
> Researcher: With reading material, you would find something like this [*showing her again*].
> Participant: That's new. … [Humanities, Interview, line 401-410].

The above extract demonstrates that this student was unaware of the licences that enable open content. The other variables did not seem to provide meangful findings hence, they have not been presented.

Furthermore, in the questionnaire, participants were further asked their conception of OER (Appendix A, Question 25). They were asked to choose all the options, from the provided list, that related to their conception of OER.

Figure 5.33 illustrates the participants' responses.

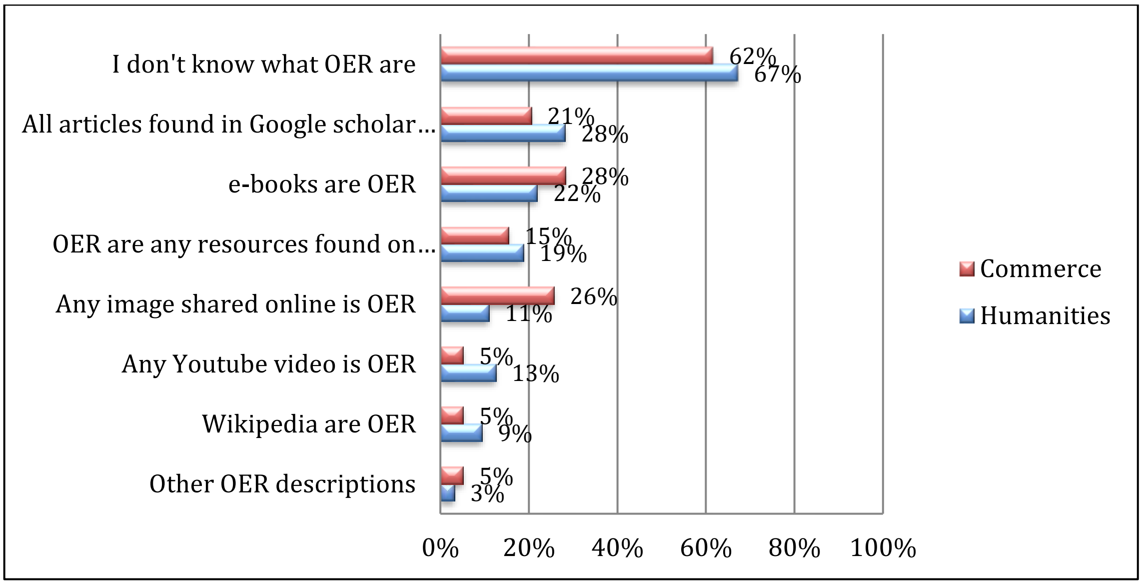

Figure 5.33: Student conception of open educational resources

A large percentage of students from each of the courses indicated that they did not know what OER were (62% from Commerce and 67% from Humanities). These student conceptions imply that students may have been unaware that they were using some OER. Despite the provision of the description in the questionnaire and the lecture on OER by the Commerce lecturer, it seems that students were guessing what OER are. For instance, of the four students who chose 'other', two each were from Commerce and Humanities. The Commerce students wrote that OER include the 'Online library (UCT)' and 'Khan Academy', while the Humanities students wrote that OER include 'UCT library content' and 'academic journal articles (EBSCO host)'. These may need to be interpreted cautiously. The data indicates that there is limited student knowledge about OER and, by implication, legal issues surrounding the information they access and use.

Participants were also asked ((Appendix A, Question 26)) the source from whom they first heard about the concept of OER. They were allowed to choose more than one source from the list that was provided (orientation/induction, tutorial session, peers, library information, course website/learning management system (LMS), web searches, or other). They also had to indicate whether they had first heard about OER when they completed the questionnaire in this study. Their responses demonstrated that they heard about OER from various sources; seven of which were common for both courses while four were not (Table 5.8).

Table 5.8: Source where students first heard about the concept of OER

Source where students first heard about the concept of OER	**Commerce (n = 39)**	**Humanities (n = 64)**
This is the first time I am hearing of it	49% (n = 19)	52% (n = 33)
Course website/LMS	1	0
Lecture	2	0
Orientation/induction	1	4
Orientation/induction; Tutorial session	2	1
Peers	3	2
Peers; Library information	1	1
Tutorial session	6	1
Web searches	1	2
Orientation/induction; Tutorial session; Peers; Library information; Course website/LMS; Web searches	1	0
Orientation/induction; Library information; Web searches; Tutorial session	0	5

Most of the respondents were hearing about OER for the first time when they were completing the questionnaire (49% and 52% from Commerce and Humanities respectively). Three per cent and 5% of participants from Commerce had learnt from the course website/LMS and lecture respectively, while none of the Humanities participants learnt from these sources. Also, a low percentage of participants from both courses had heard about OER during orientation/induction (3% from the Commerce course and 6% from the Humanities course), tutorial sessions (15% from Commerce and 2% from Humanities), peers (8% from Commerce and 2% from Humanities), and Web searches (3% each, from both Courses). The respondents from both courses had also heard from more than one source. Some responses from the Commerce course had also heard about OER in their lectures and had learnt from their Course website/LMS. The above implies that only a few students had heard about OER in their formal course settings such as Course website/LMS, lectures and tutorials.

When participants were asked in the focus groups and interviews whether they were aware what OER are, they all said: ‘No’. When probed by naming Wikipedia and Khan Academy, the respondents confirmed that they were not aware that Wikipedia and Khan Academy were an OER and OER repository, respectively. When asked how those who used Khan Academy had got to know about it, responses varied; one Commerce participant had heard about it while she was at high school and again at the beginning of the year, and two had heard from classmates, while one Humanities participant had heard from a friend. These students, though, were not aware that the resources were OER.

Furthermore, to determine whether students could identify OER used in their courses, in the questionnaire (Appendix A, Question 27) they were asked whether their lecturers had ever used OER as part of their teaching materials and how they (as students) had learnt that the resources were OER (Appendix A, Question 28). That is, they were asked to name the course that used OER (Appendix A, Question 29) and then explain how they had learnt that the resources used in the course they named were OER.

Only eight participants indicated that their lecturers used OER in their courses (this includes any other courses they are enrolled for) and described how they got to know that the resources used in those courses were OER (Table 5.9).

Table 5.9: Name of course and how students learnt that OER were used

Name of course that uses OER	How students learnt that OER were used
Commerce	"It was a link we could access to get more information" "Through a lecture" "Through notes posted on Vula" "You could access it for free on the internet, it's not copyright" "We were told that OpenUCT was"
Humanities-related courses	
Economics, English, Mathematics	"Logic"
Film and Media studies	"Was told to look for it"
Quantitative literacy for humanities (MAM1022) and Social work (SWK1020)	"Everyone could access it"

These extracts suggest an ambivalence about the concept of OER and what is freely, but not legally, available on the internet. This suggests that OER were introduced in Commerce (also see the learning activity rules in Section 5.5). However, the above demonstrates that 92% (on average) of the participants could not identify OER used in their courses.

To further determine whether students could identify OER, they were asked whether any of the digital resources that they created, adapted or redistributed were OER or not (Appendix A, Question 31). For each of the multimedia resources, they had to tick one of these options: 'Some were OER', 'None were OER', 'I am not sure' or 'Not Applicable'. Participants' responses demonstrate that for all the multimedia resources, the highest numbers were for those who were not sure whether the resource was an OER or not (see Appendix J for Figures 1-8). The fact that most students were unsure of the legal status of those resources they created indicates that the students were unaware of what OER are. This implies that these students also struggled to ascertain whether the resources they adapted or redistributed were OER or not.

5.4.2.2 Evaluation of online resources

Participants were asked whether and how frequently they evaluated (checked for the appropriateness of) online information for their assignment or projects (Appendix A, Question 16). They had to indicate how frequently they checked for credibility of authors (such as who the author is, his/her other peer-reviewed publications) of online information, currency (how up-to-date the information was at the time of students accessing it), objectivity (if the source provides a balanced viewpoint or bias information) and reliability of information (if there are any other sources that provide the same information). Figure 5.34 is an illustration of the frequency at which the participants evaluate online information or resources.

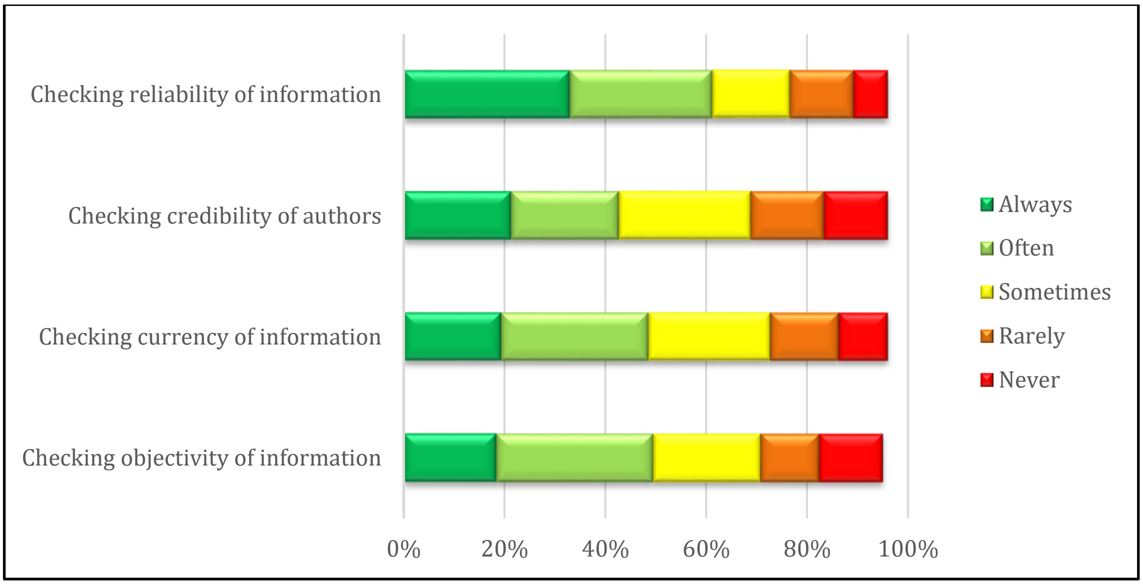

Figure 5.34: Student evaluation of online information

The data reveals that in descending order, participants always checked for reliability of information (33%), credibility of authors (21%), currency (19%) and objectivity (18%) of information. Also, in descending order, participants never checked for credibility of authors (13%) and objectivity of information (13%), currency (10%) and reliability (7%) of information. This means that the least evaluated dimension is the objectivity of information.

Furthermore, each of the dimensions of evaluation ranged across course, age and gender. In terms of disciplines, a third (33%) of both Commerce and Humanities students always checked for reliability of information (Appendix J, Figure 1). A small percentage from both courses never checked for reliability of information. Overall, there were no noticeable differences between students in the two disciplines with regard to this dimension.

In addition to this, the qualitative data reveals that there were mixed perceptions about Google as a reliable source of information. For instance, a Commerce respondent reported that her group found it necessary to evaluate information for reliability:

> . . . and also to check that the webpages that we were reading were accurate because we can't rely on only one, we had to read up on several different sources about the software because one could say something good about the software and other could have bad views [Commerce, G2, line 74-76].

Another one said:

> We don't look at one person's page . . . if the definition comes up more than once and they look similar, we assume it is true [Commerce, Interview, Line 313-314].

This is the participant who also explained that she used the information presented in lecture slides as a means of evaluating reliability of the information she found on Google; whereas, some participants seemed confident about information from Google; for instance, a Humanities student said:

> You just search what you want on Google. You write what you want and then it appears. You know, it's Wikipedia or what or just write on Google exactly what you want. Like, if you missed something, they will say: "Are you actually, trying to say this?" and you say: "Yes, this is what I want to say" [Humanities, G1, line 246-248].

By contrast, another Humanities student revealed that she preferred using the prescribed readings to information from the internet. She said:

> Yes, because with the internet, you are not sure whether it is somebody's view or the truth . . . fact or fiction . . . whether it is something that someone has said and everybody else reacted on and now, it suddenly becomes real, or is it actually, a fact. So, when it comes to something like that, I don't want to write something that is fiction and pass it off as fact because that would be a nightmare in an essay [Humanities, Interview, line182-185].

This extract indicates that the student is quite astute about credibility concerns about information online, or not confident in evaluating the reliability of information she finds online. A Chi Square test of course distribution and whether or not students checked for the reliability of information revealed that there was no correlation between courses and checking for reliability of information.

In terms of age, a larger percentage (38%) of those 18 years old or younger than those between 19 and 22 years always checked for reliability of information (Figure 5.35).

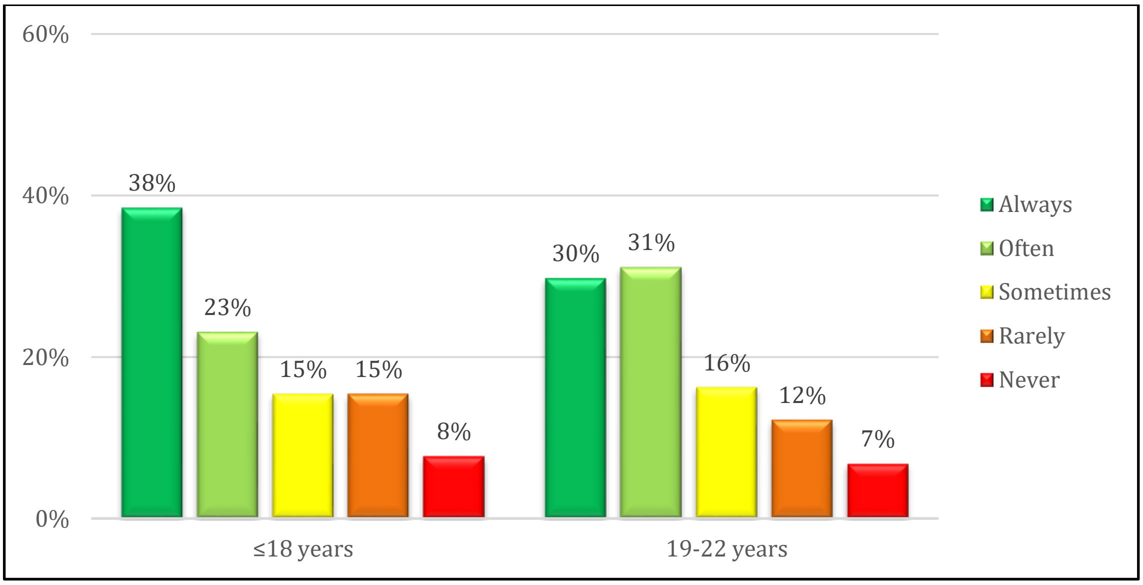

Figure 5.35: Age distribution and frequency of checking reliability of information

In terms of gender, there was only a two percent difference, with more female students than male students always checking for reliability of information (Figure 5.36).

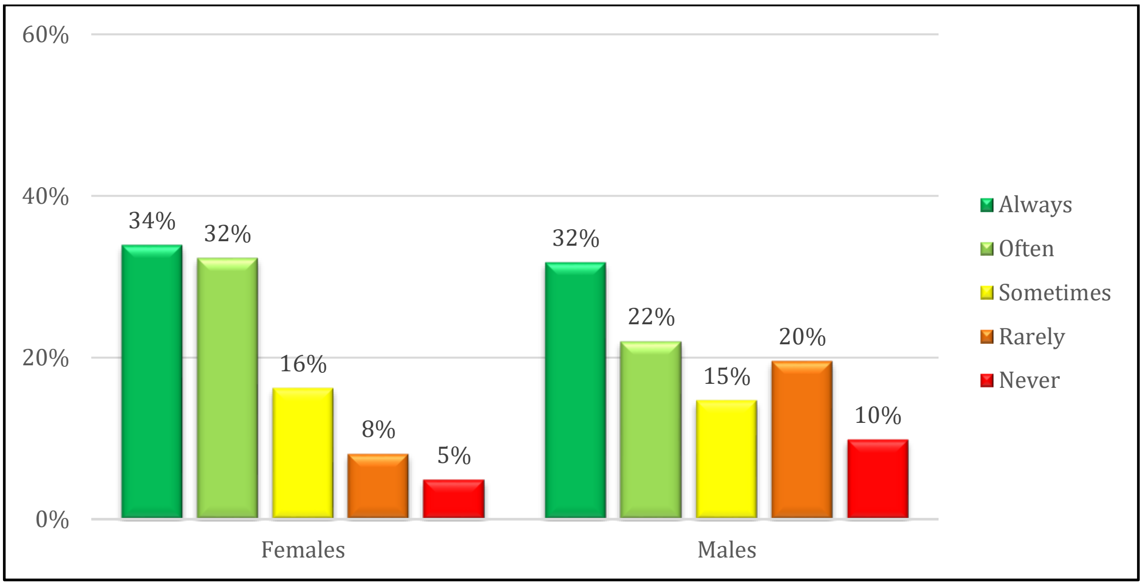

Figure 5.36: Gender distribution and frequency of checking reliability of information

A larger percentage of males (10%) than females (5%) never checked for reliability of information. Overall, more of the younger students and female students evaluated information for its reliability compared to the older students and male students.

The second highly rated evaluation aspect is checking credibility of the authors of information that students used for their learning tasks. There was a striking difference, where 27% of Humanities participants always checked the credibility of authors as compared to the Commerce participants (13%) (Figure 5.37).

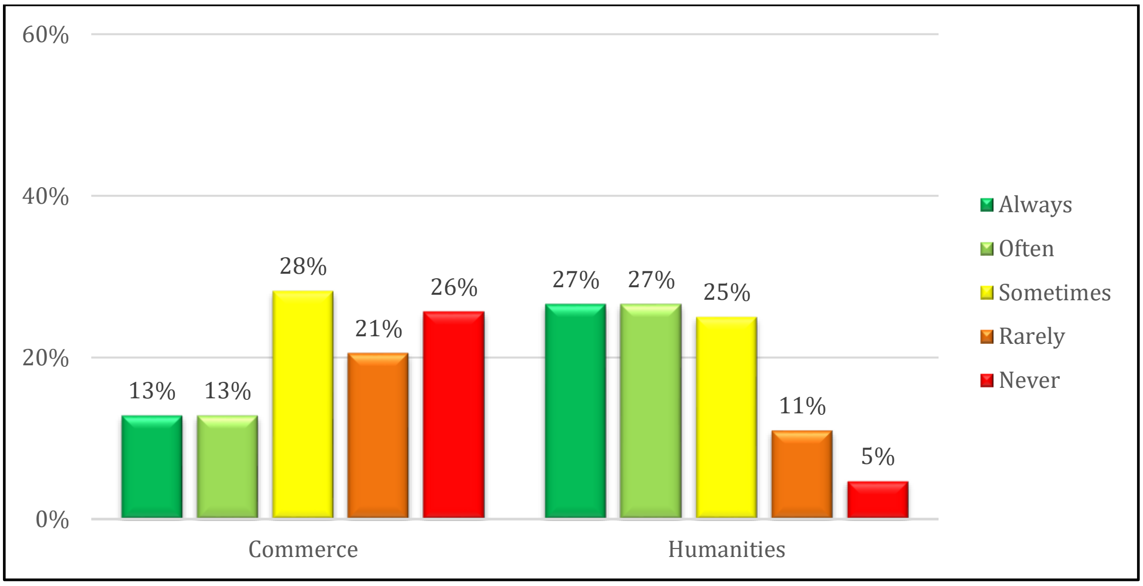

Figure 5.37: Discipline distribution and frequency of checking credibility of authors

By the same token, 26% of Commerce students never checked the credibility of authors.

With respect to age, the data reveals that there is no noticeable difference between the two age groups with respect to checking credibility of the authors of information they used for their learning tasks (Appendix J, Figure 2).

Regarding gender, a larger percentage of female students (23%) always checked the credibility of authors when compared to male students and at the same time, a larger percentage of male students than female students never checked for the credibility of authors (Figure 5.38).

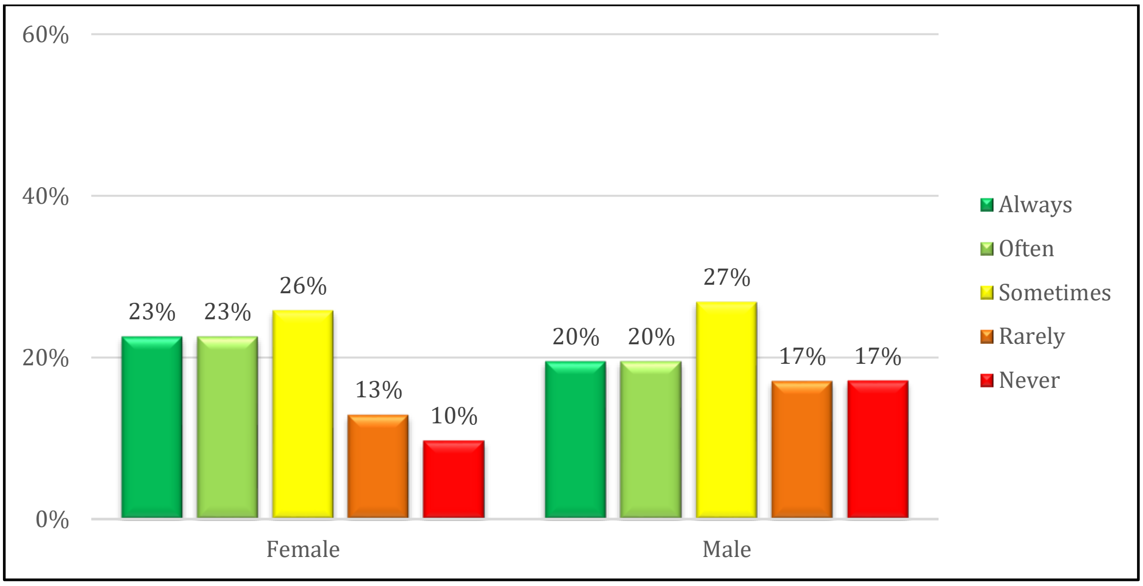

Figure 5.38: Gender distribution and frequency of checking credibility of authors

Overall, more Humanities students always checked the credibility of authors compared to the Commerce and male students.

With regard to the frequency of evaluating currency of information, the data reveals that while a slightly larger percentage (21%) of Commerce students than Humanities participants (19%) always checked currency of information, also a larger percentage (15%) of Commerce students than Humanities students (6%) never checked currency of information (Figure 5.39).

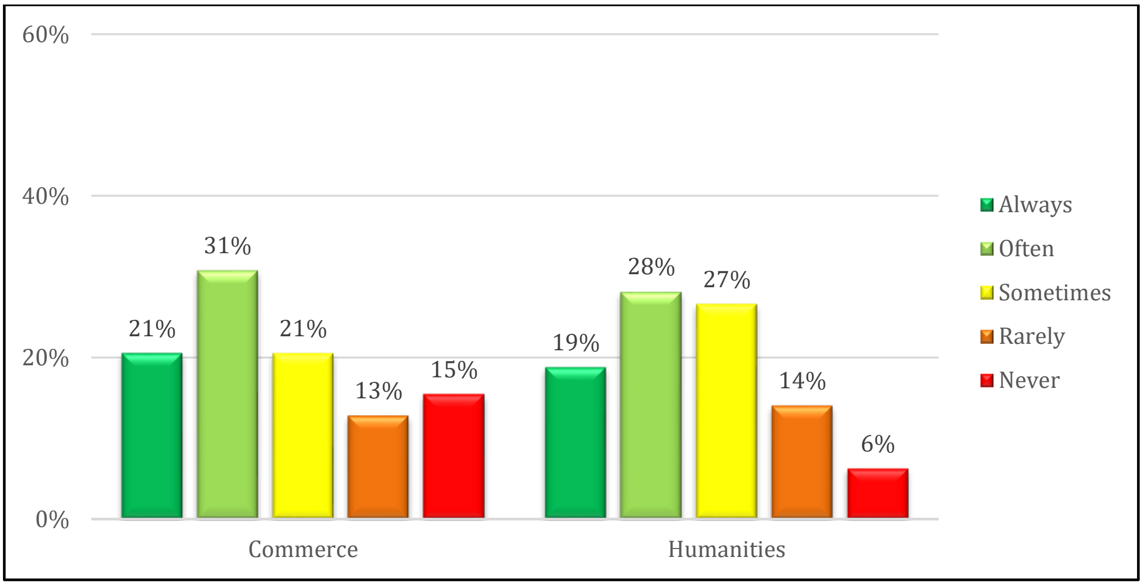

Figure 5.39: Discipline distribution and frequency of checking currency of information

While a large percentage (23%) of those 18 years old or younger always checked currency of information, also a relatively large percentage (15%) never checked currency of information (Figure 5.40).

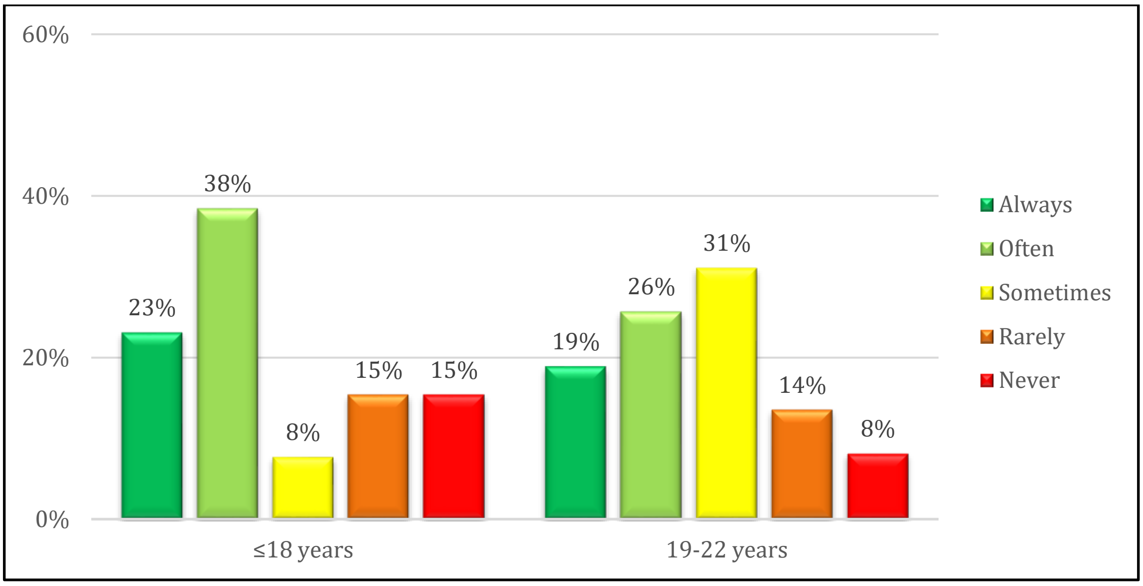

Figure 5.40: Age distribution and frequency of checking currency of information

This data reveals that a higher percentage of those students between 19 and 22 years checked currency of information when compared to those 18 years old or younger.

A larger percentage (22%) of male students than female students (18%) always checked currency of information, while also a larger percentage of females (11%) than males (7%) never did so (Figure 5.41).

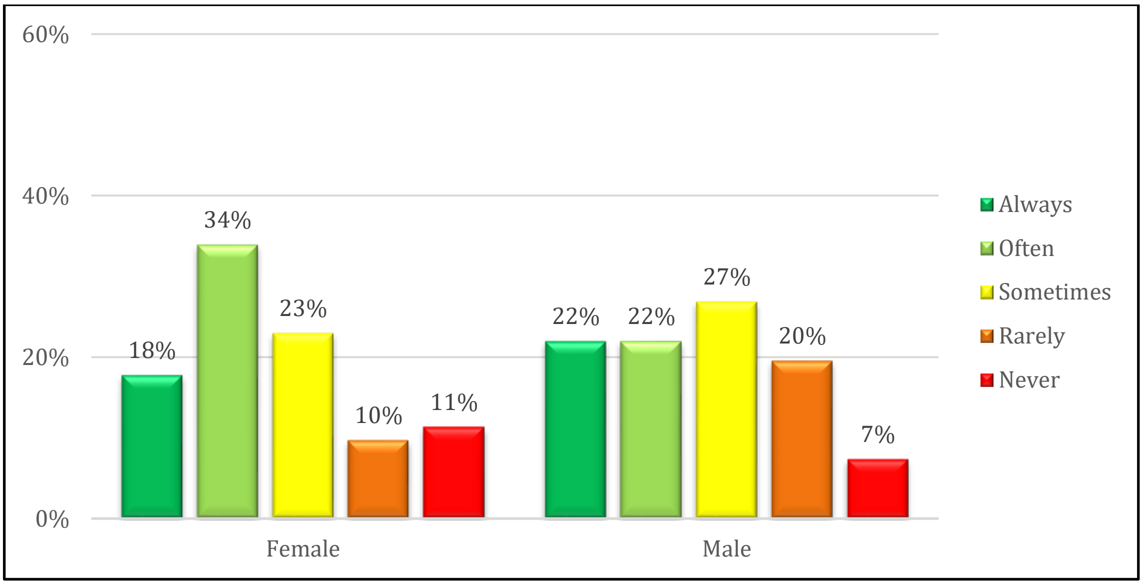

Figure 5.41: Gender distribution and frequency of checking currency of information

Overall, more older students and male students always checked currency of the information they used for their learning tasks as compared to younger students and female students

Furthermore, a larger percentage (23%) of participants from Commerce always checked for objectivity of information and at the same time a larger percentage (21%) of Commerce participants never did so when compared to the Humanities students (Figure 5.42).

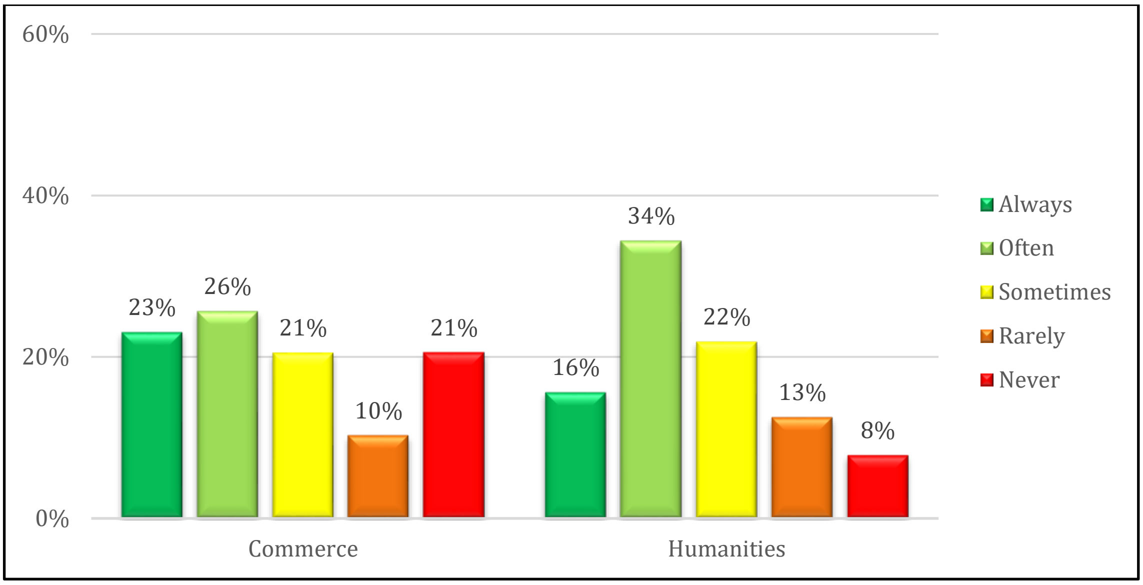

Figure 5.42: Discipline distribution and frequency of checking objectivity of information

Regarding age, the data reveals that a larger percentage (23%) of those 18 years old or younger than those between 19 and 22 years always checked the objectivity of information while also a larger percentage (15%) of the younger than that of the older never did so (Figure 5.43).

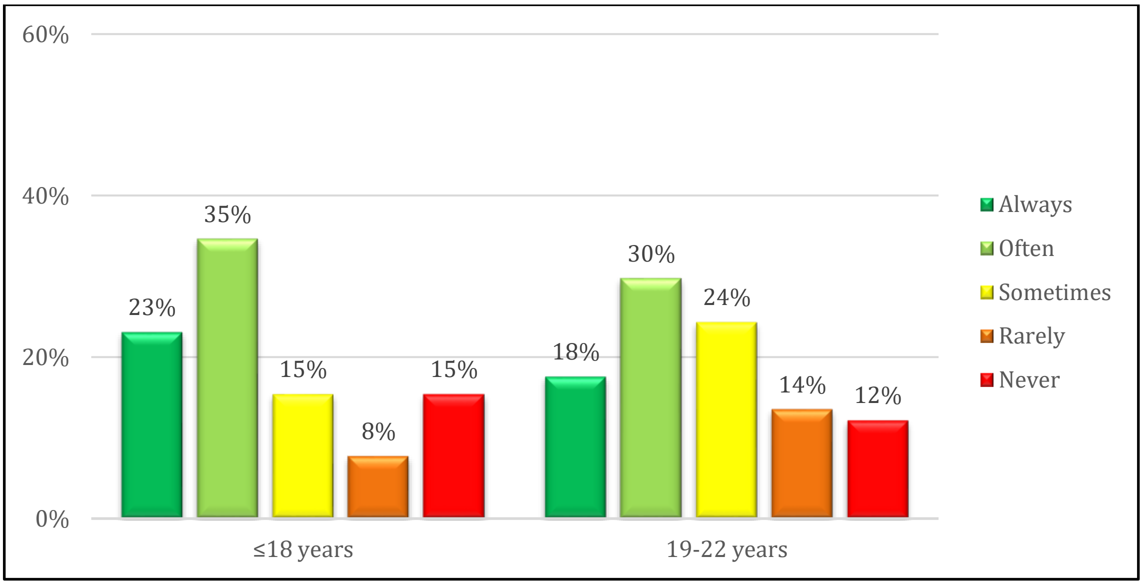

Figure 5.43: Age distribution and frequency of checking objectivity of information

Regarding gender, while there is no marked difference between females and males checking for objectivity of information, a slightly larger percentage of males (15%) than females (11%) never checked the objectivity of information (Figure 5.44).

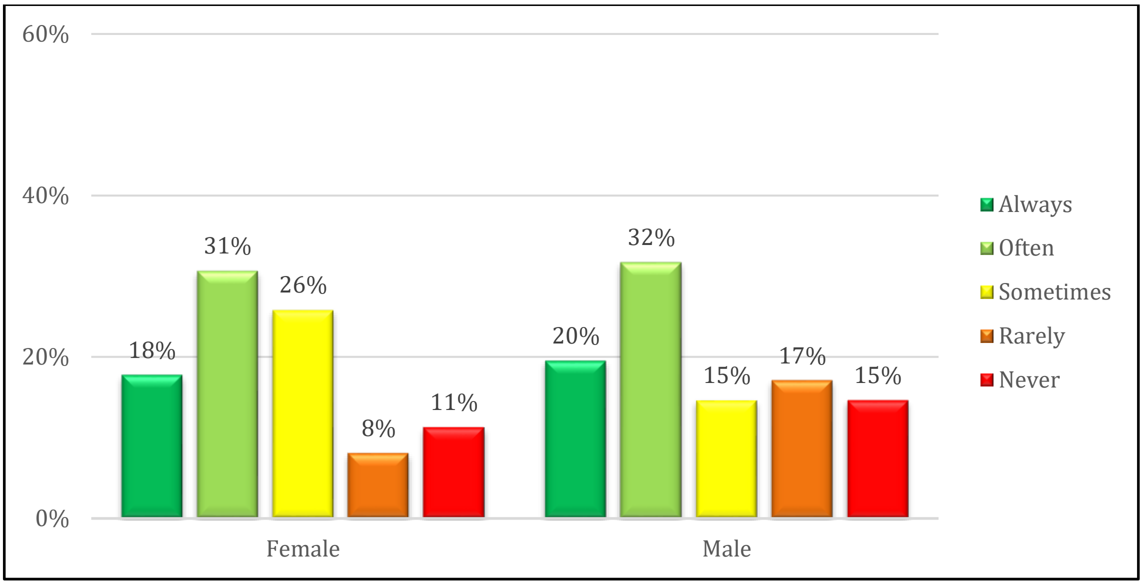

Figure 5.44: Gender distribution and frequency of checking objectivity of information

Overall, more Humanities students and older students checked whether the information sources provided a balanced viewpoint of, or biased, information. Other methods of evaluating online information that emanated from the data included checking for authenticity of online resources, clarity of information and usefulness of online resources.

Authenticity of online resources

The qualitative data also demonstrated how students evaluated the authenticity of online resources. Two Commerce participants explained that they evaluated the authenticity of online resources by looking up the author of the resources they used, where and which company published the resources. They acknowledged that this caused them not to use Wikipedia. One of these students also explained that he did not use blogs because some bloggers do not cite their sources.

Responses from three Humanities participants indicated that in addition to the prescribed readings, they trusted content from published textbooks, Google Scholar and JSTOR, because these resources are peer-reviewed. One of them also reported that if he found a resource on Google, such as lecture material, he would identify the authors and institutions with which they are associated as an indicator of credibility. Another Humanities student said that she checked how many people had cited the resources; she then used Google Scholar to track the number of citations of an article she would like to use in her essay. This implies that the number of citations boosted her confidence in, and trust of, the article without having to find out who the authors were or with which institution they were associated.

Clarity of information

When students were asked how they evaluated resources for quality, a Commerce participant's response demonstrated that she did not check for author details, but rather assessed how clear the information was:

> Researcher: When you get the information from the search engines, do you find out who the author of the material is?
> Participant: Mhhm [No], for me, I just look at which one is the easiest to understand, which one I'll be able to put in my own words . . . say if they use a lot of jargon and I don't understand it, then I'll just go to the next result or website or article that is shown on the search engine [Commerce, Interview, line 289-293].

Furthermore, the data reveals that most respondents accessed resources as provided in the Google search list; they would move to the next link if they did not understand the content of the previous one.

Usefulness of online resources

An interesting aspect was students' evaluation of usefulness of resources. For instance, a Commerce participant said that she checked the number of views of a YouTube video and if five or fewer people had viewed it, she assumed that that resource was not useful.

Furthermore, with respect to enrolling in a computing subject or not, the data reveals that high percentages of students from both groups evaluated the appropriateness of the information they used (Figure 45).

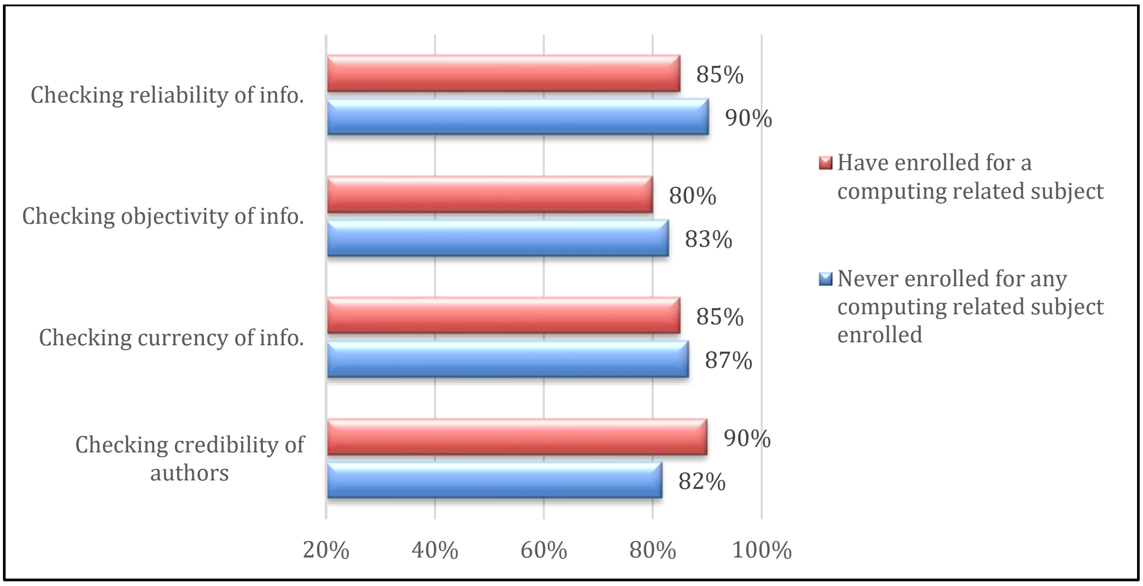

Figure 5.45: Enrolment in a computing-related subject and checking for appropriateness of information

A higher percentage (90%) of those students who had never enrolled for any computing-related subject than those students who had done so checked for reliability of information; whereas a higher percentage (90%) of those students who enrolled for a computing-related subject checked the credibility of information. The above discussion analysis suggests that evaluation of the appropriacy of information is influenced by the discipline (and the nature of learning and assessment activities), gender and age.

5.4.3 Techno-cognitive dimension of digital literacy practices

Digital literacy practices in this dimension, as presented below, include adapting and redistributing other people's resources using productivity software, producing and using multimodal resources, finding online resources for their studies, curating and managing, and making informed decisions when selecting appropriate digital technologies (Figure 5.46).

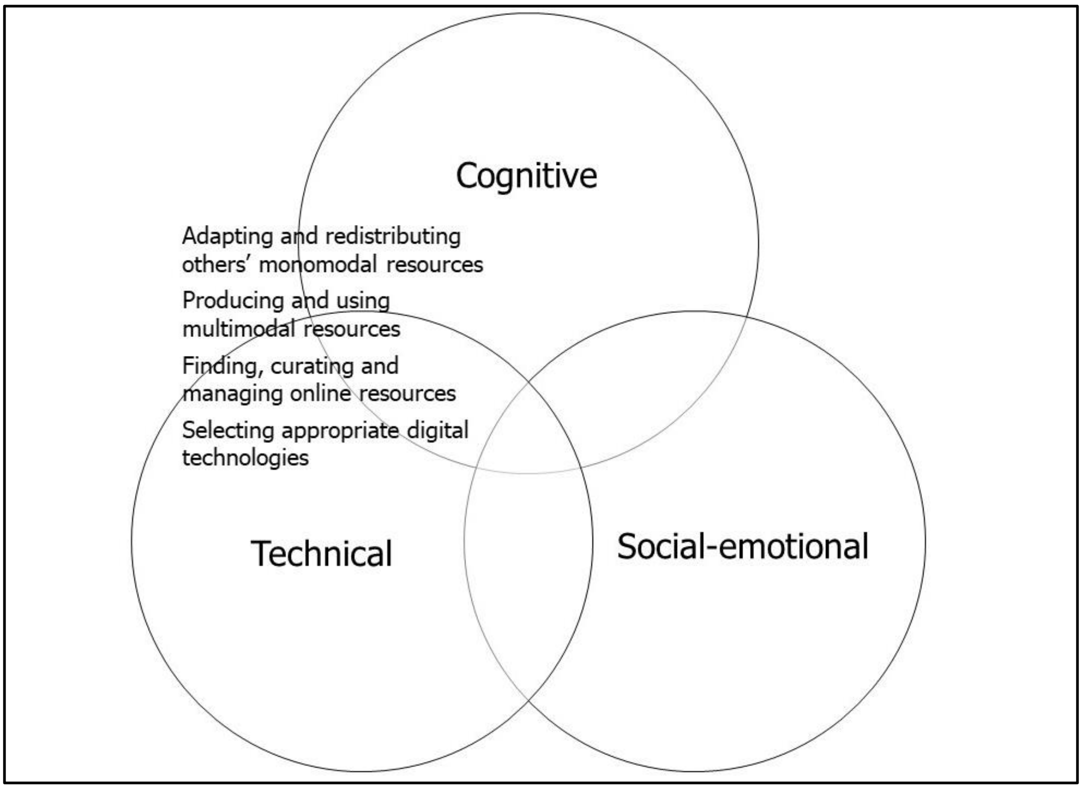

Figure 5.46: Student digital literacy practices in the techno-cognitive dimension

5.4.3.1 Adapting and redistributing other people's resources using productivity software

Participants were asked to indicate, by ticking all the practices that applied to them, whether they adapted others' resources for their personal use and redistributed others' resources using productivity software (Appendix A, Question 23).

The responses demonstrated that a higher percentage (15%) of Commerce students than Humanities students adapted other people's word-processed documents; whereas a higher percentage (16%) of Humanities students than Commerce students adapted other people's presentations (Figure 5.47).

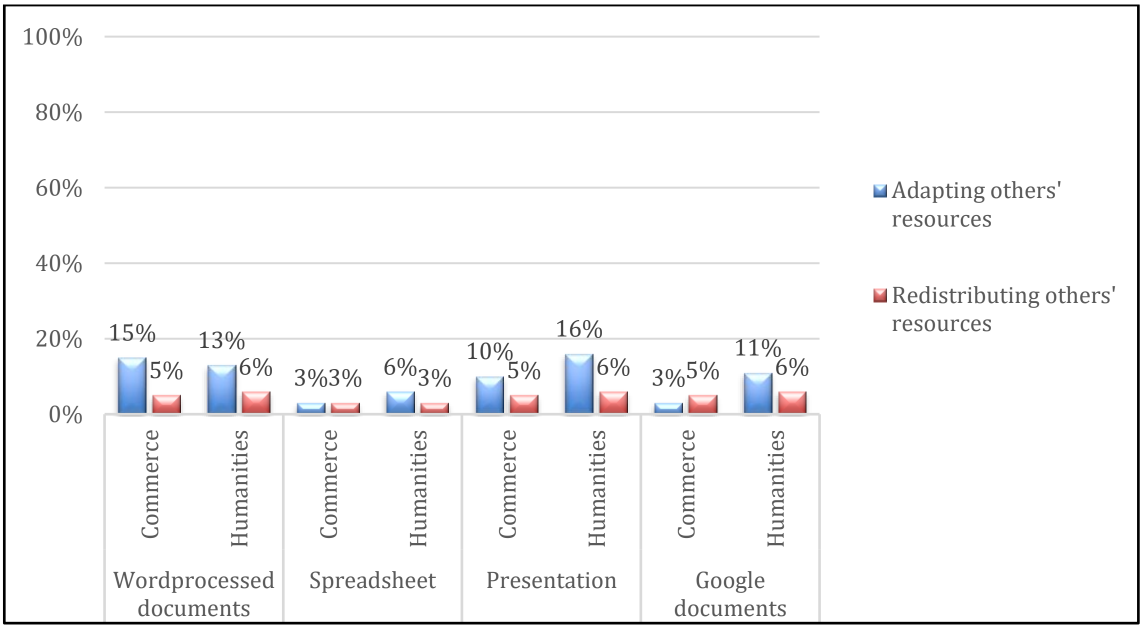

Figure 5.47: Disciplines and techno-cognitive practices using productivity software

No correlation was found between disciplines and adapting or redistributing others' resources.

In terms of age, a higher percentage (15%) of those 18 years or younger than those between 19 and 22 years old adapted other people's word-processed documents and presentations for their own use (Figure 5.48).

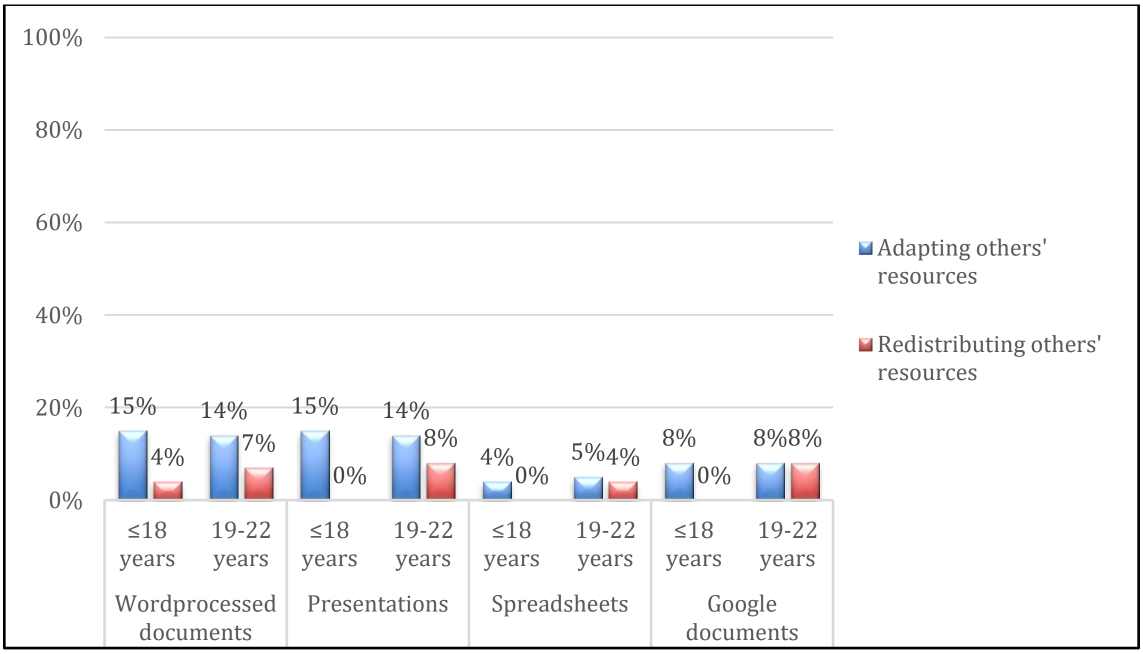

Figure 5.48: Age and techno-cognitive practices using productivity software

No correlation was found between age and the two techno-cognitive practices.

In terms of gender, a higher percentage (16%) of female students adapted other people's word-processed documents and presentations when compared to male students (Figure 5.49).

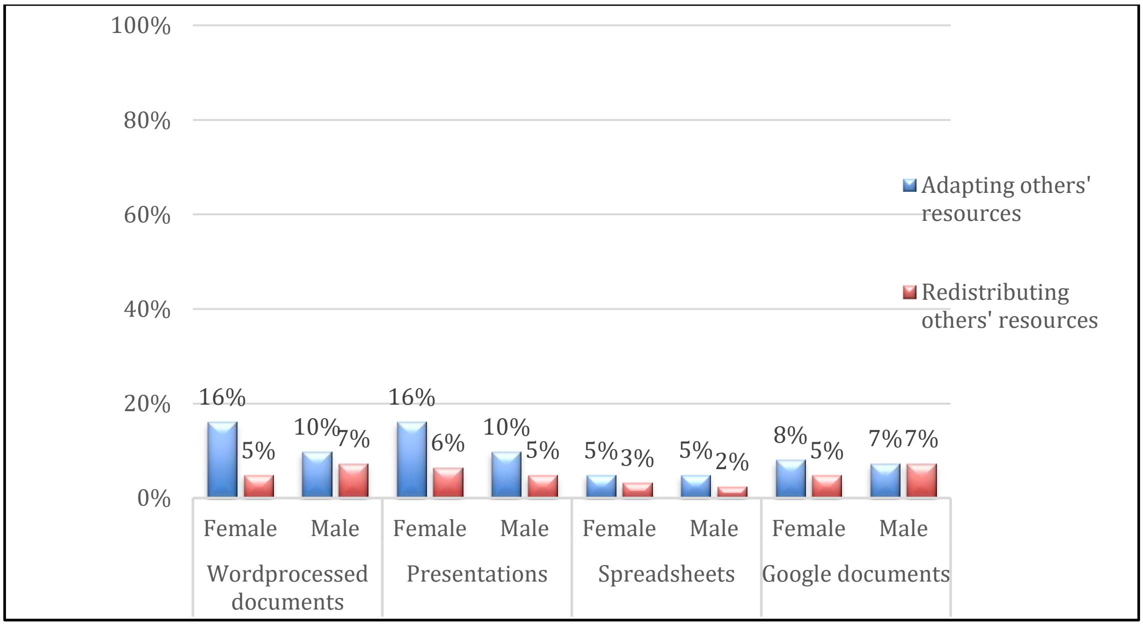

Figure 5.49: Gender and techno-cognitive practices using productivity software

No correlation was found between gender and the practices of adapting or redistributing others' resources.

With respect to enrolment in a computing-related subject whilst at high school, higher percentages of those students who enrolled in a computing-elated subject than those students who did not do so, adapted other people's presentations (40%), word-processed documents (30%), Google documents (25%) and spreadsheets (15%) (Figure 5.50).

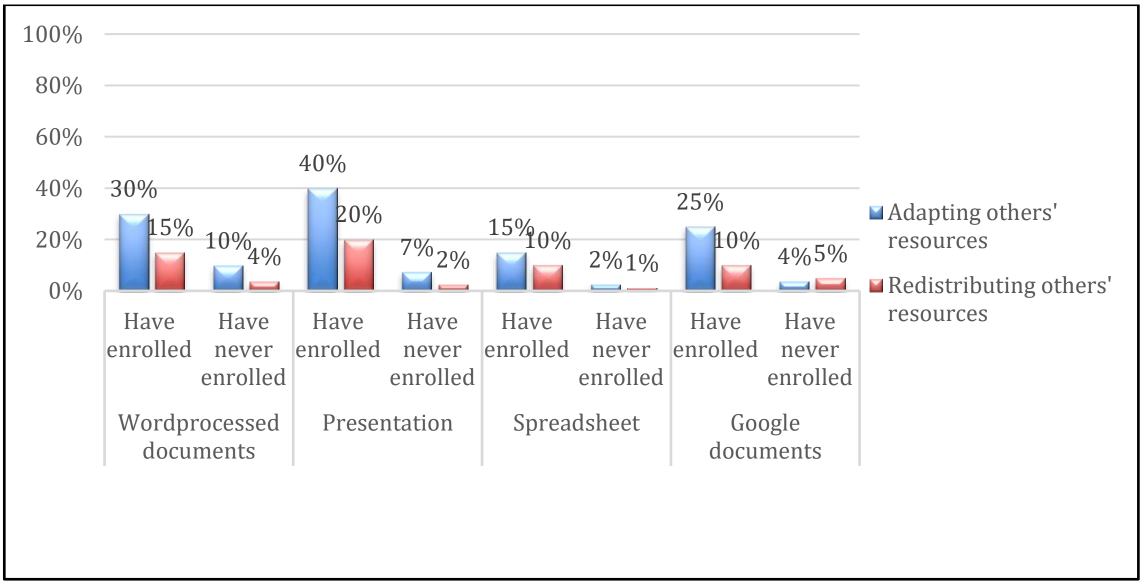

Figure 5.50: Enrolment in a computing-related subject and techno-cognitive practices using productivity software

A Chi Square test confirmed a positive correlation ($p<0.05$) between enrolling in a computing-related subject and adapting other people's presentations and Google documents.

5.4.3.2 Producing and using multimodal resources

Participants were asked to indicate what practices they conducted using media authoring and sharing technologies (also called Web2.0 or open technologies) (Appendix A, Question 23). Respondents were asked to tick all the practices that applied to them, such as creating own resources, sharing own resources, tagging own resources, using others' resources 'as is', tagging others' resources, adapting others' resources for their personal use, and redistributing others' resources. The media types included podcasts, images, videos, screencasts, websites and wikis (such as Wikipedia).

In terms of practices, in the respective order of the Commerce and Humanities courses, higher percentages of participants primarily created images (56% and 31%), and videos (38% and 23%) as compared to other practices (Figure 5.51).

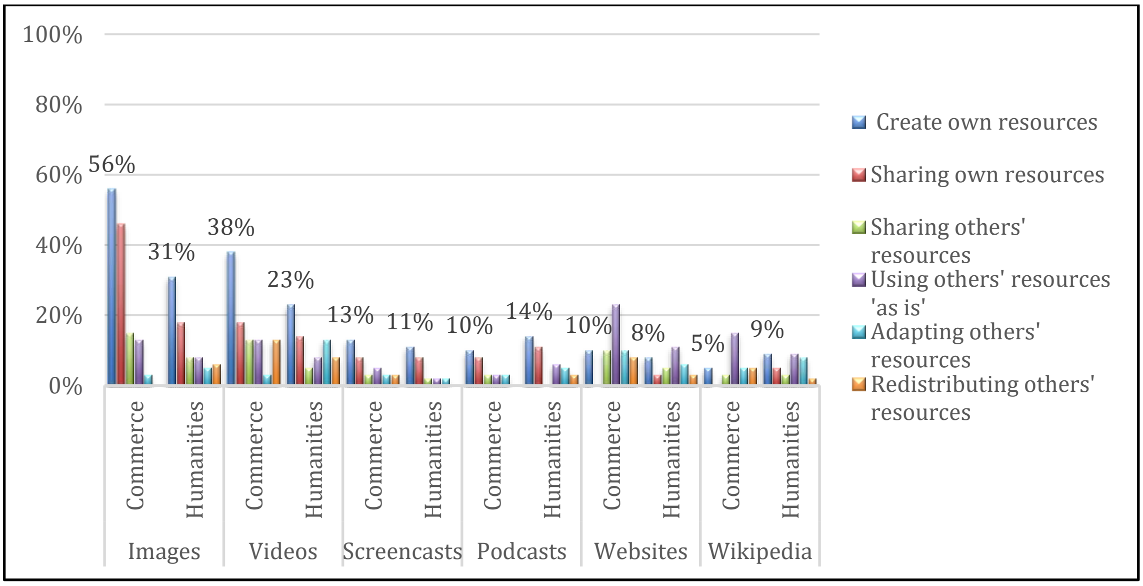

Figure 5.51: Disciplines and students' use of multimodal resources

Regarding images, an 18% difference was observed in terms of sharing; a larger percentage (31%) of Commerce participants compared to those of Humanities (13%) shared their own images. Also, a Chi Square test revealed that there was a correlation between being a Commerce student and creating images ($p<0.05$) and sharing images ($p<0.05$). Furthermore, a higher percentage of participants from both courses used other people's websites (with 23% in Commerce and 11% in Humanities) when compared to creating their own. A larger percentage of Commerce participants also used other's Wikipedia resources (15%) when compared to creating theirs (9%). A higher percentage of Humanities participants adapted others' videos (13%) and created podcasts (14%) when compared to those of Commerce. None of the participants tagged their own website or Wikipedia resources.

To ascertain whether there was a relationship between courses and student purposes for using digital media (Appendix A, Question 24), the type of digital media created within each course was plotted against the purpose for their use (Figure 5.52).

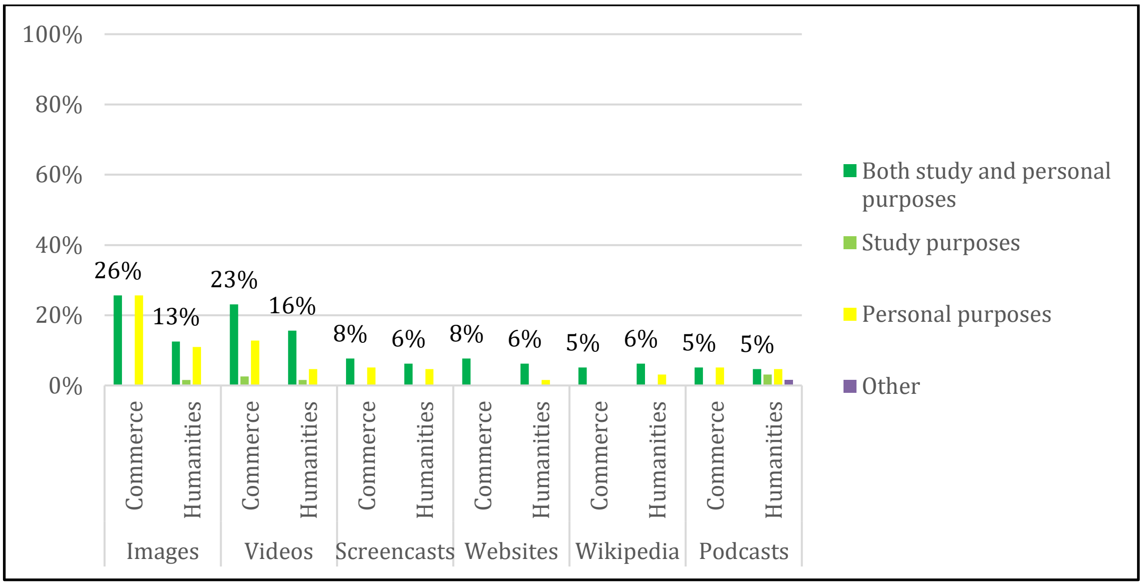

Figure 5.52: Disciplines and students' purpose for producing multimodal resources

In both disciplines, all the media resources, except images, were primarily created for both study and personal purposes. High percentages of Commerce students created images (26%) and videos (13%) for personal purposes when compared to Humanities students. Also, 2% (n = 1) of Humanities students used podcasts for other purposes.

The qualitative data reveals that the commonly used videos for learning were YouTube videos (a detailed description on the use of YouTube videos for learning is provided in the section on use of online resources – Section 5.4.3.2). Seven participants used media-sharing technology such as Instagram (n = 6) and SnapChat[18] (n = 1) to share images for personal purposes. For instance, a participant from Commerce confidently explained how she searched and downloaded pictures posted by people on Google, Tumblr or Instagram, and other people's image codes and shared them 'as is' on WhatsApp, or took a screenshot of the code and shared it on Instagram. Another one revealed that she also used Instagram to share pictures; she managed the settings to allow only certain friends and family members to view them. Also, two participants from Humanities captured pictures using Instagram and shared

[18] photo-sharing social network that can also be used for quick videos (of a maximum length of 10 seconds)

them on their webpages. Four respondents from Humanities used Instagram for taking pictures and uploading them there, posting videos, 'liking', and commenting on others' pictures. Also, although all three Humanities participants confirmed that SnapChat was still a newly used tool in South Africa and so they were still learning how to use it, one respondent explained that she was less confident than her friends in using SnapChat, and so she mostly watched celebrities' videos and sometimes posted pictures.

There was no mention of video creation in the Commerce focus group or interview discussions, while three Humanities participants reported that they created and remixed their own music pieces. One of the students who created music explained how he did this:

> I have also started my own channel on YouTube . . . I just post music. I do singing, so I just sing and then post it on my channel . . . I record myself with my cell phone and tablet. I use my cell phone to play the music instrument while recording myself on a tablet and then post on YouTube [Humanities, G1, line 181-187].

Another novel video creation practice was revealed by a Humanities participant who 'snapped' videos using SnapChat and posted them on her webpage.

In terms of video re-use, three respondents from Commerce said that they searched for, and shared, YouTube videos with friends or family members. One of them shared household tips and songs with her mother and sister, respectively:

> I suppose I do that every day . . . like, with my sister, . . . yesterday, I was sharing this gospel song because she is the worship leader in my church so I share with her songs that she could try out and teach other people in church [Commerce, Interview, line 215-217].

Also, five of Humanities participants used videos for personal purposes: two listened to music, two watched, and shared the politics and parliament videos with friends (using WhatsApp and e-mail), and one watched motivational speakers' videos. Furthermore, when Humanities participants were asked whether they ever shared YouTube videos with other students, the one who watched motivational speakers said:

> It depends; sometimes, I save the video on my drive and then maybe send it to someone who may seem interested in it. I first make you watch the video and then share it with you if you are interested in it. I don't just distribute [Humanities, G1, line 152-154].

In addition to the above, one of the two who watched politics and parliament and music videos reported that she shared music videos with her friend to ascertain whether she related to them or not. She also shared the politics videos with a friend, either by WhatsApp or e-mail:

> Participant: I don't even check them [videos for learning purposes]. I check the ones for politics . . . because I want to watch what happening in parliament.
> Researcher: Do you share that?
> Participant: I don't because you find that something that is in context is little, little, little.
> Researcher: When you share, do you share via WhatsApp?
> Participant: Ja, I share on WhatsApp . . . I just click on that share thing but with other people, I share via e-mail because they complain that I am 'eating their data' [because it requires them to download . . .].
> Researcher: They prefer accessing their e-mails on campus?
> Participant: Yes [Humanities, G2, line 127-135].

Another Humanities participant also reported that he shared different media, including YouTube links, in his respective WhatsApp social groups (such as a football club, choir, friends). The above discussion demonstrates that participants searched for YouTube audio/visual resources based on their needs and shared them 'as is' with appropriate groups.

To ascertain whether there was any relationship between the age of students and the use of digital media, the digital media types were plotted against student ages. Higher percentages of both age ranges mainly created images and videos as compared to other practices carried out with these and other resources (Figure 5.53).

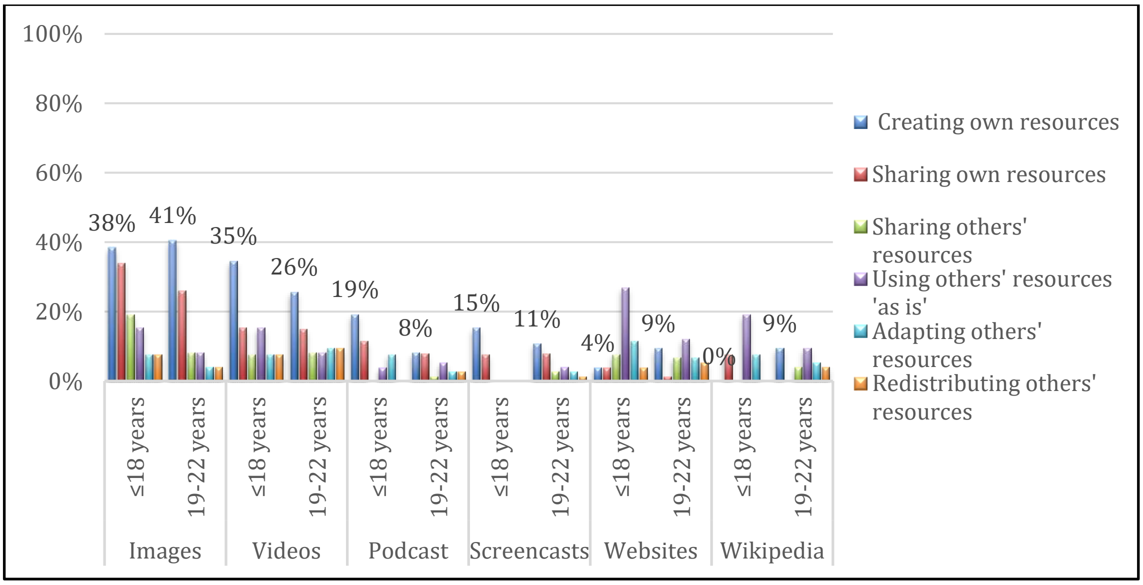

Figure 5.53: Age and use of multimodal resources

In the respective order of the younger and older age groups, students primarily created images (38% and 41%) and videos (35% and 26%) as compared to other resources. That is, a higher percentage of the older students created images when compared to the younger ones. Also, a higher percentage of the younger students used other people's websites ('as is') (27%) and Wikipedia (19%), created podcasts (19%), and reused images and videos when compared to the older ones. A Chi-Square test further revealed a correlation between younger students and creating podcasts ($p < 0.05$), redistributing images ($p < 0.05$) and sharing Wikipedia resources ($p < 0.05$).

Regarding gender, when the resources were plotted against student gender, a common practice carried out by females was the use of other people's websites 'as is' (Figure 5.54). That is, females primarily searched for information on websites.

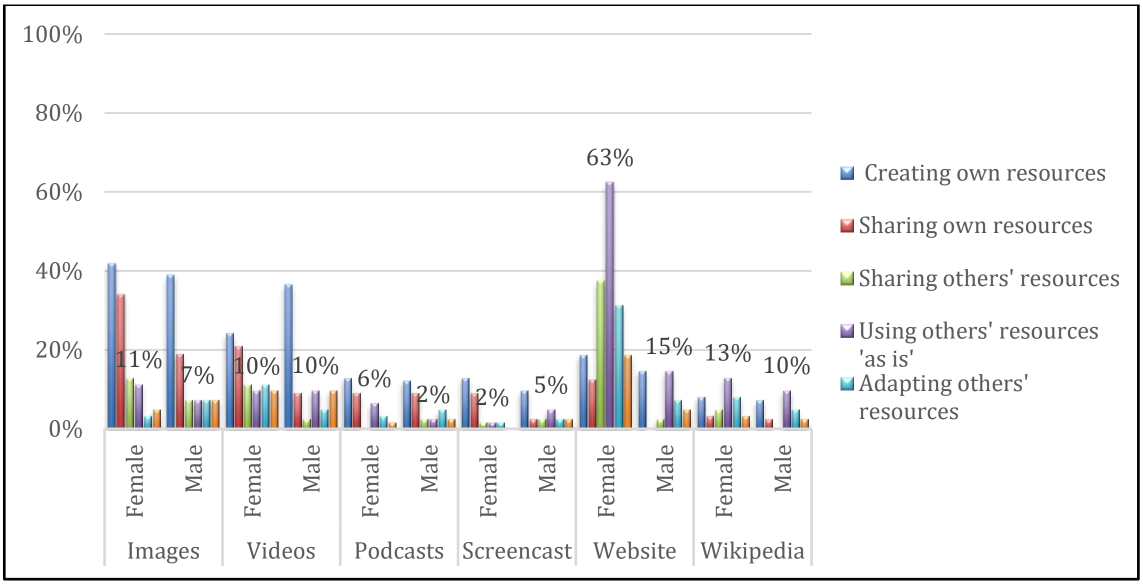

Figure 5.54: Gender and use of multimodal resources

Although it was not a noticeable difference, a higher percentage (42%) of females created images when compared to that of males (39%). A higher percentage of males (37%) created videos when compared to females, while a higher percentage (63%) of females re-used other people's websites when compared to males; 38% of females tagged others' websites, 31% adapted others' websites and 19% redistributed others' websites. However, no correlation was found between gender and the production and use of digital multimodal resources.

With respect to enrolling or not in a computing-related subject, higher percentages of those who enrolled in a computing-related subject whilst in high school than those who never did so, created (70%) and shared (70%) their own images (Figure 5.55).

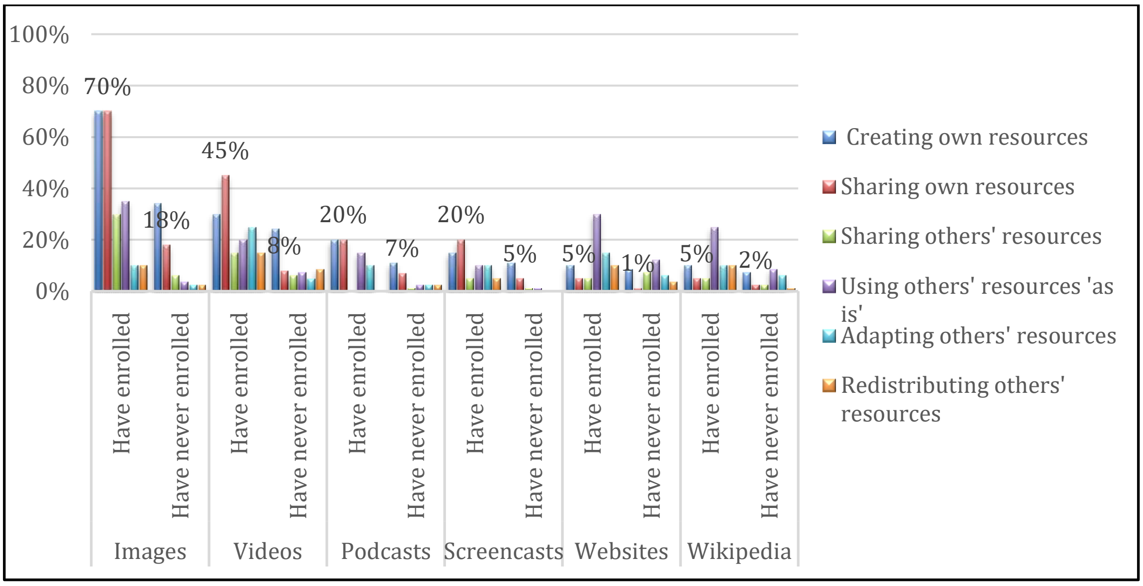

Figure 5.55: Enrolment in a computing-related subject and use of multimodal resources

A higher percentage of those students who enrolled for a computing subject while in high school than those students who never did so used other people's websites (30%) and Wikipedia resources (25%). This implies that they searched for information from the internet and Wikipedia. A significant correlation ($p<0.05$) was found between those enrolled in a computer-related subject and creating images, sharing their own and other people's images and using other people's images without adapting them.

Overall, the findings reveal that enrolment in a computing-related subject is more important than the discipline in terms of using multimodal resources. That is, prior ICT experience influences how students use multimodal resources more than the course in which students are enrolled.

Furthermore, to determine student use of blogs, students were asked to indicate how frequently they updated their own blogs, read other people's blogs or commented on other people's blogs (Appendix A, Question 17). The first option also gave an indication of whether students had blogs at all. Finding are illustrated in Figure 5.56 below.

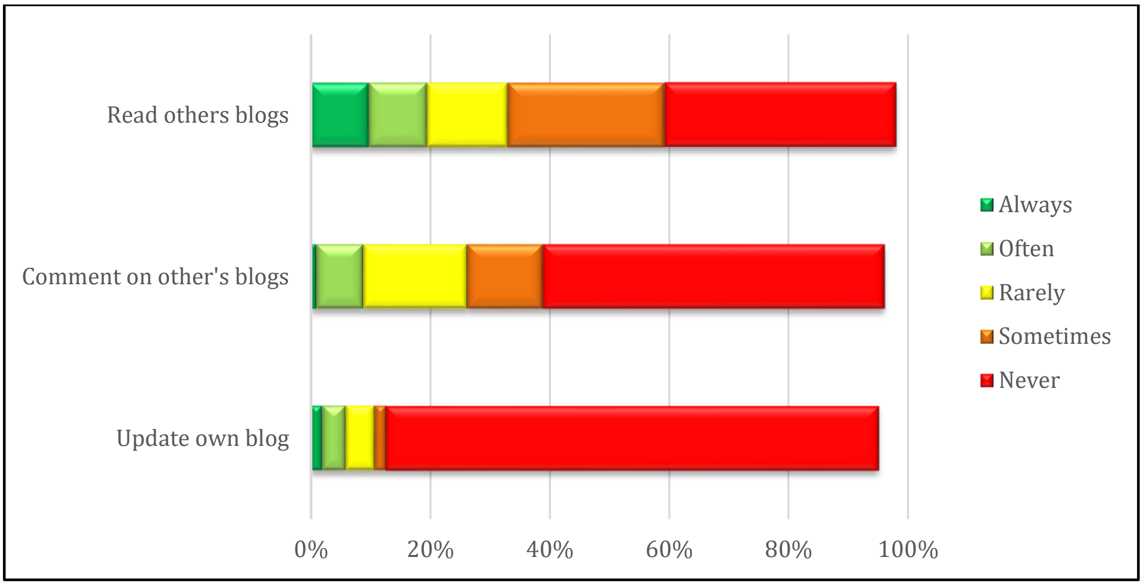

Figure 5.56: Student blogging activities

A higher percentage (10%) of the participants always read other people blogs when compared to commenting on them and updating their own blogs. Figure 5.56 also illustrates that relatively high percentages of participants never read other people's blogs (39%), commented on other people's blogs (57%) or did not own or create a blog (83%).

With respect to disciplines, an overall percentage of 16% and 9% of students from Humanities and Commerce respectively update their own blogs (Figure 5.57).

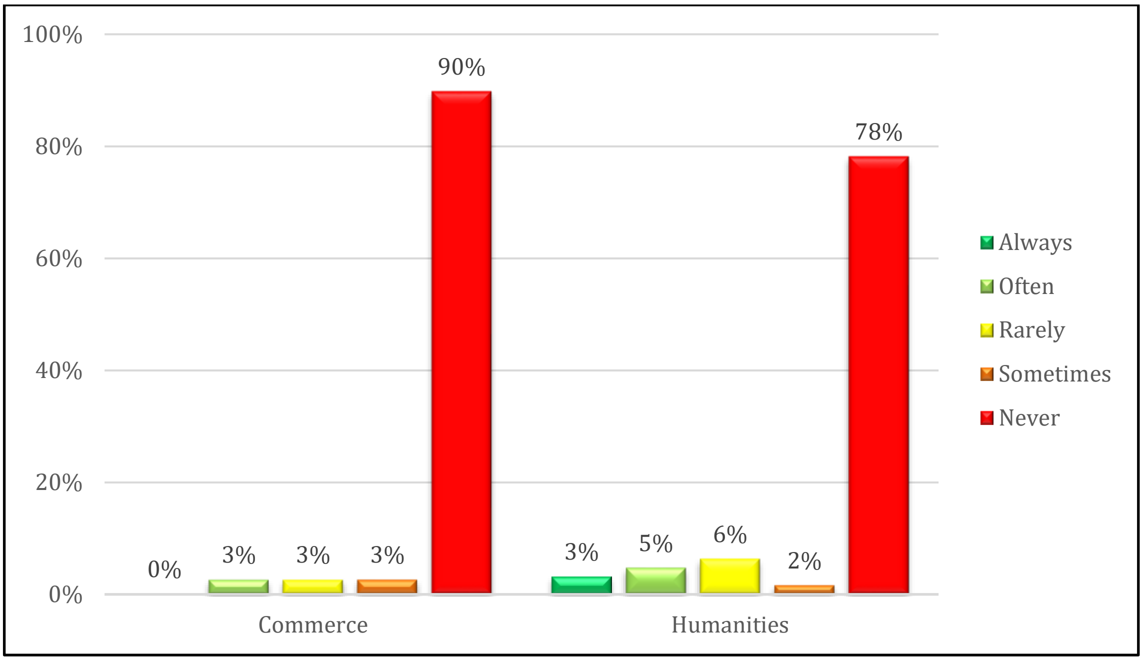

Figure 5.57: Disciplines and updating own blog

The above findings demonstrate that blogging was not a course requirement. The qualitative data reflected that one Commerce student used blogs for learning, if she happened to come across them while searching for online information (see section on online resources). Also, one Humanities student reported that she read and commented on other people's blogs (for personal purposes).

Regarding age, the quantitative data reflects that 20% and 8% of those 18 years or younger, and between 19 and 22 years respectively, updated their own blogs (Figure 5.58).

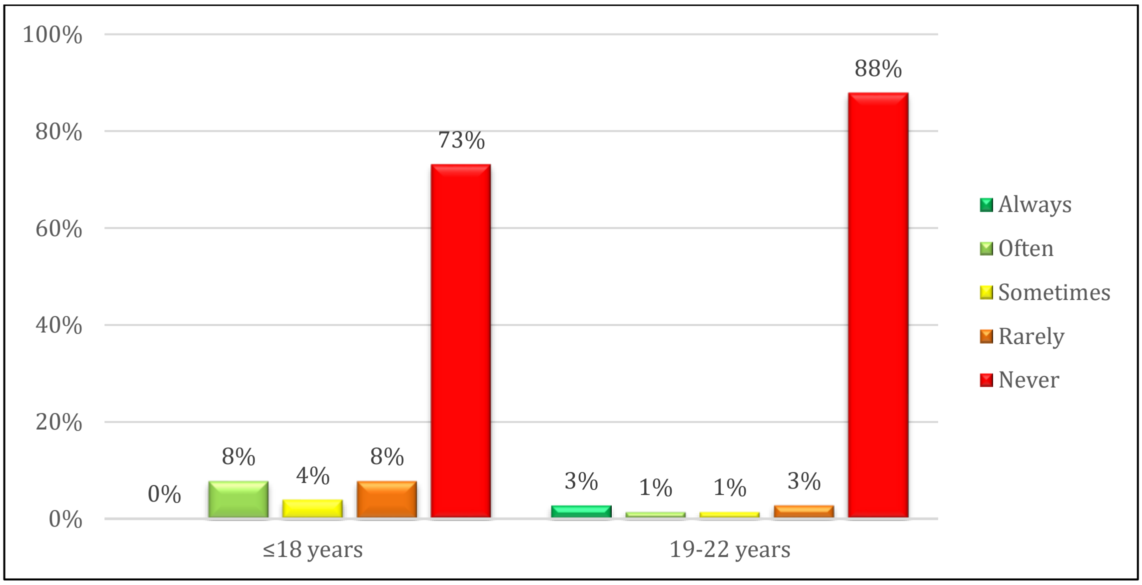

Figure 5.58: Age and updating own blogs

There was no difference regarding gender: 13% and 11% of female and male students respectively updated their own blogs (Appendix J, Figure 3).

Regarding student enrolment in a computing-related subject in high school, a marginally higher percentage (13%) of those students who never enrolled in any computing-related subject than those students who did so, updated their own blogs (Figure 5.59).

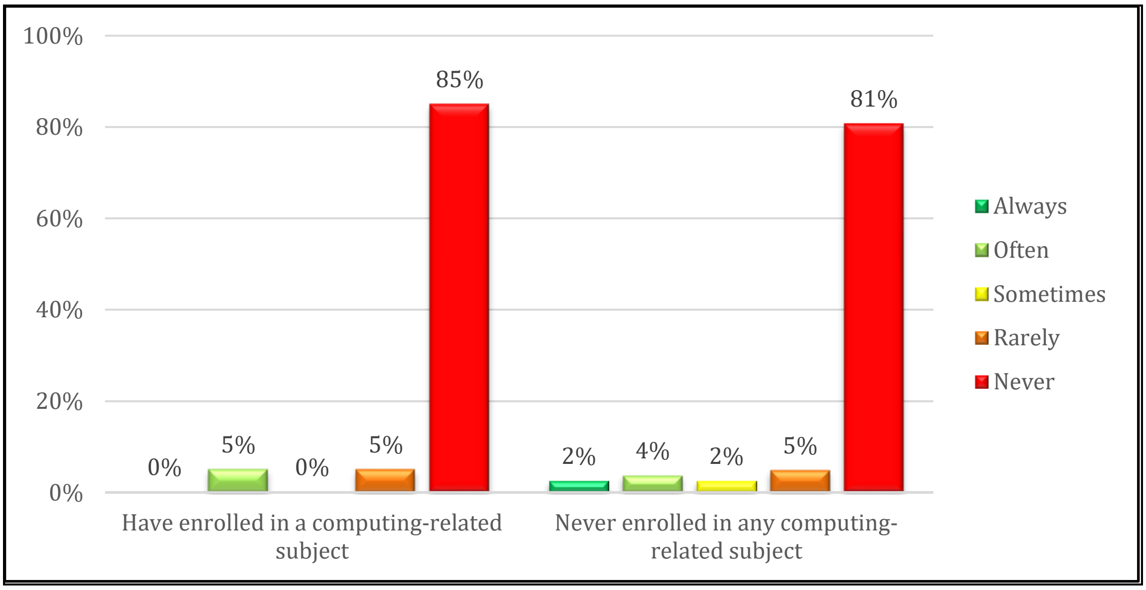

Figure 5.59: Enrolment in a computing-related subject and updating own blog

The above findings reveal that although the vast majority of students did not create their own blogs, a higher percentage of those students from Commerce, who are younger and had never enrolled in any computing-related subject created their own blogs from their volition.

In summary, student production of multimodal resources and use are influenced by discipline, student age and student enrolment in a computing-related subject whilst in high school.

5.4.3.3 Finding online resources relevant for studies

When students were asked what web tools they used for searching online resources for learning (Appendix A, Question 15)., in the respective order of the Commerce course and Humanities course, 90% and 81% of students used search engines, 72% and 45% used Wikipedia, 13% and 73% used Google Scholar, 36% and 17% used SlideShare, iTunes or Tedtalks, 23% and 14% used blogs, 13% and 20% used OER directories, and 21% and 11% used OER institutional repositories to search for information for their studies (Figure 5.60).

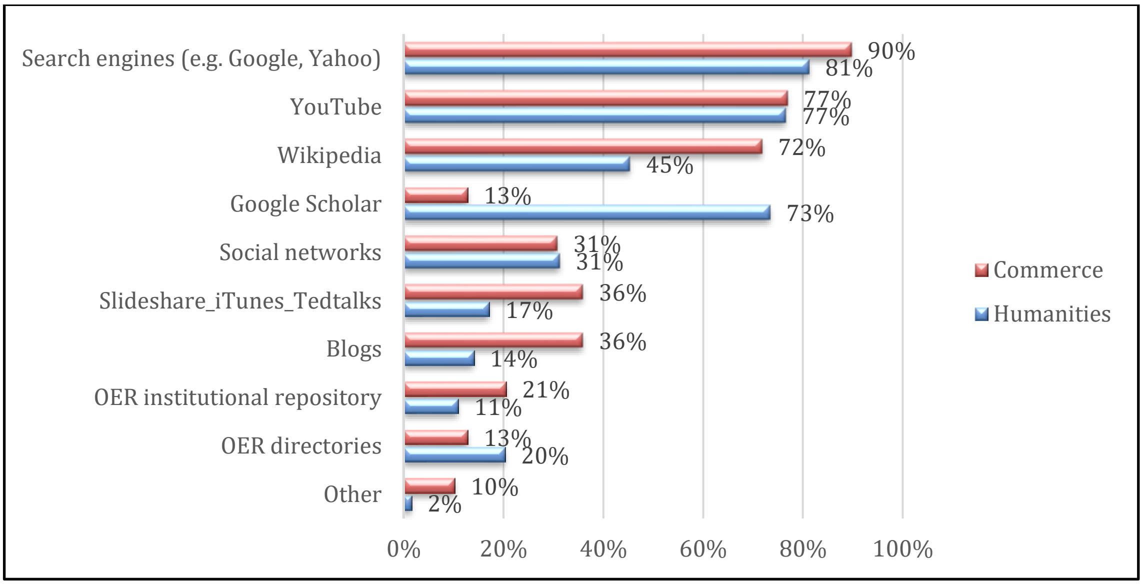

Figure 5.60: Disciplines and student search for online resources

There were no differences in student use of YouTube (77%) and social networks (31%). A small percentage of students indicated that they used other resources; one student in Commerce used Learn Accounting[19], two students from Humanities used Journal Storage (JSTOR), while one each used newspapers, and videos and links from lecturers. The Commerce participant reported that the Learn Accounting videos were recommended by his lecturer (from another course). He said that he found them useful, more especially that he could access videos from lecturers at other universities. This indicates that this student was unaware that Learn Accounting was an OER repository. Another Commerce participant reported that he used Lexis Nexis[20], a portal with knowledge-based solutions for areas such as law, tax, accounting and finance. From the Humanities course, five participants reported that

[19] http://learnaccounting.uct.ac.za/
[20] www.lexisnexis.co.za

they used JSTOR and one of them said it was recommended by lecturers and tutors (from other courses). One of these students said that she used JSTOR and Google Scholar because they had peer-reviewed articles. Also, two students used EBSCOhost, while one used newspapers to find real-life updates and examples for her essays.

Firstly, Figure 5.64 illustrates that search engines and YouTube (as mentioned earlier) were frequently used by participants from both disciplines, followed by Wikipedia in Commerce and Google Scholar in Humanities. Secondly, a Chi-Square test confirmed positive correlation between the Commerce course and use of Wikipedia ($p < 0.05$) and the Humanities course and use of Google Scholar ($p < 0.05$). It is, therefore, of interest to establish what might cause the difference in use of Wikipedia and Google Scholar in the two courses. Lastly, because the use of OER for learning in higher education is an emerging phenomenon, and these happened to be the least-used resources in both courses, it is of interest to determine students' awareness of OER and the associated licences such as Creative Commons licences. Below is the qualitative description of how and why participants searched for information using the listed online resources in their respective courses.

(i) Use of search engines

When participants were asked what kind of information they searched for using the search engines, the students' responses demonstrated that they used Google for various purposes.

Using Google to find information

In Commerce, two students used Google to find information as a means of supplementing lecture slides or even replacing the textbook. These students said:

> Basically, for us, . . . I don't know about the rest of you guys . . . we don't use any hardcopy books because it's too much of a hassle so we basically searched Google and also used the lecture slides [Commerce, G1, line 35-37].
>
> . . . but I didn't use the set book because we've got the slides. As you said, it is really, a mission to carry around textbooks these days [Commerce, G1, line 216-217].

In addition to the above, the two students highlighted that the resources they used were determined by the nature of the activity:

> It was just a Tut . . . it wasn’t . . . any extensive research so you didn’t have to do any hectic research; we just used Google and then used images . . . we just applied it . . . to the scenario [Commerce, G1, line 51-53].

The issue highlighted here implies that to choose the learning resources, students need to be aware of the type of information needed to carry out learning activities. Thus, students in this course tended to source images, and select and use information acquired from Google for their learning task.

In Humanities, students used information from Google to supplement their course readings (they have course readers). They searched for text documents and videos to get ideas on day-to-day examples. One of them said:

> Yes, I never take content from Google because our lecturer told us not to because we can’t cite it . . . it is not easy to cite . . . hence, I get the ideas from the clips and go back to my readings and look at the summaries I’ve made, and present my case in the assignment [Humanities, G3, line 257-259].

Using Google to find definitions, and learn course-related concepts

Students from both courses used Google to search for definitions and learn about course-related concepts. For instance, two Commerce students reported that they used Google to find definitions about business types, while five searched for information to learn about concepts such as supply-chain management and information flow. Two Humanities students searched for definitions and also went to the extent of looking up synonyms when paraphrasing in their essays:

> . . . for instance, when paraphrase, you have to write what an author said, in your own words so I look for synonyms on Google, . . . I use Google everyday basically . . . to check for synonyms, nouns, adverbs, adjectives, things like that [Humanities, G3, line 188-190].

Students also researched concepts related to their courses:

> We wanted to understand what a supply chain management was so we used Google, the textbook and slides in order to understand it [Commerce, G3, line 153-154].

> I didn’t quite understand the effects of people’s race in apartheid. I couldn’t ask my colleagues because none of us were around that time, and I was not at home where I could ask my parents or the rest of the family members so first thing was: “Google it” [Humanities, Interview, line 106-109].

(ii) Use of YouTube

Participants searched for YouTube resources to support their learning. Although there was no mention of instances where students were required to use YouTube for learning in Commerce, three participants reported viewing YouTube videos to enhance their learning of other courses (not the one where research was being carried out). For instance, two students reported that they used YouTube to acquire information for their Economics essays and one student indicated that he used Learn Accounting video resources for his Accounting course. Also, two other participants reported that they used YouTube for learning, one said that she watched crash courses on Economics and other courses, and another one used a Maths page on YouTube, called MathsTutor[http://www.mathtutor.ac.uk] to learn some aspects that she struggled to understand in Mathematics.

By contrast, Humanities students were assigned videos on a weekly basis to watch, assimilate and complete a task on the Vula. YouTube videos were included as part of the learning material posted on the course site. Moreover, four participants included one of the YouTube videos[https://www.youtube.com/watch?v=MlabrWv25qQ] on their essay reference list. Two participants had also used other YouTube videos[https://www.youtube.com/watch?v=UcWsTwvtyOI] for their essays in this course. Furthermore, one participant also mentioned that their lecturer (in another course) recommended, and also gave them links to, YouTube videos, while another two said that they searched for YouTube videos to learn what they did not understand in class (for other courses). The above demonstrates that the use of YouTube videos was determined by student volition in Commerce and primarily by lecturers' pedagogical approaches in Humanities and related courses.

(iii) Use of Wikipedia and Open textbooks

The data illustrates a range of reasons of why and how students used or did not use Wikipedia. Three Commerce students and two Humanities students, who were quite confident about using Wikipedia, intimated that they used Wikipedia to acquire an understanding of course-related concepts.

For instance, a student from Commerce said:

> I have used it before. I usually use it when I don't understand stuff . . . just to get an idea. … I would look at it [content form Wikipedia] and then compare it to the textbook . . . because Wikipedia puts things into perspective whereas the textbooks just explain concepts in isolation. Wikipedia also gives examples so it kind of helps with the understanding [Commerce, G3, line 161-165].

Also, a student from Humanities elaborated as follows:

> I check Wikipedia for everything and then understand it and then I check what scholars say because . . . ok, sometimes you find that something that is there . . . on Google Scholar or JSTOR; any academic writing, . . . if I don't understand it, I just go to Wikipedia and search and search then I can understand the academic writing easily [Humanities, G2, line 31-35].

Furthermore, one student from Humanities reported that she used Wikipedia to read up on authors' backgrounds because she believes that any author's writing is influenced by his or her background in a particular way. Another student from Humanities used Wikipedia audio clips so he could listen while doing something else on his computer.

As revealed in the above excerpts and discussions, students used information from Wikipedia to acquire a better understanding of concepts in their prescribed learning activities, but they did not directly remix content from Wikipedia in their essays or learning activities. This implies that their understanding of concepts may have been gleaned from Wikipedia, and this could have potentially influenced what these students had written. For instance, in the above excerpts, students said that they read Wikipedia content to complement the abstract academic writings in textbooks and articles respectively. Two of these students, together with other two who chose not to use Wikipedia for learning, reported that they were told at high school that they could not trust Wikipedia content because anybody could edit it. One said that her lecturers forbade the used of Wikipedia because they said it is not written in an academic fashion and another one said it is because students are often unable to reference the original source. However, it is important to note that Wikipedia has editorial control processes that enhance the quality of Wikipedia articles where, for instance, the original owner of the article uses a 'watch list' feature to constantly monitor edits to his or her article; the owner can then review them to ensure quality[21]. A student from Commerce added that he had been advised to pursue references from Wikipedia instead of using Wikipedia entries/items per se.

[21] https://en.wikipedia.org/wiki/Wikipedia:Editorial_oversight_and_control

Furthermore, one student from the same course reported that she used Wikipedia for only personal purposes to extend knowledge:

> If it is for me, if I am looking up something at my own personal time, I will use Wikipedia but if it is something for school, then I won't use Wikipedia . . . if I am interested in, . . . information about a particular artist or someone then I will go to Wikipedia and look that person up or if I want to find out about a particular building, then I will go to Wikipedia but if I want to submit an assignment, then I won't use Wikipedia for that [Commerce, Interview, line 168-174].

Thus, the qualitative data demonstrates that students primarily used Wikipedia as a learning resource rather than for content authoring or contribution.

Regarding open textbooks, the student essays reference lists reflect that 16 of the Humanities participants used an open textbook[22] . However, none of them reported that they had used an open textbook for their essays, which suggests that they were unaware about how to classify this resource. Even though an open textbook was recommended for their second essay and five of them used this open textbook chapter for the third essay, it would seem that the 'openness' factor did not register as a distinguishing characteristic of this resource.

(iv) Google Scholar

No Commerce participants reported that they used Google Scholar for the course activities while seven out of 16 (Focus groups and Interview) Humanities participants used Google Scholar for accessing peer-reviewed articles and one student explained that she used Google Scholar for generating references:

> I use Google Scholar more especially for referencing because there is that 'Cite' feature that shows you the different styles of referencing . . . I select the Harvard one and then jot down the full reference and add to my essay [Humanities, G2, line 21-23].

The above demonstrates that the nature of learning activity influences the type of learning resources that students use. In this instance, Humanities students engaged in a research- and writing-intensive exercise where they had to develop an argument while constructing essays, whereas Commerce students reported that they only had to apply knowledge, hence, two of

[22] https://opentextbc.ca/introductiontosociology/chapter/chapter12-gender-sex-and-sexuality/

them said that they used Google instead of Google Scholar for their learning activities in the respective courses.

(v) Use of social media

Similar to the quantitative data, the qualitative data demonstrates that two students used social media as learning resources. For instance, these two students from Commerce said that they followed experts in their fields, as one of them said:

> I also use Twitter but do not contribute because the content is way above my head . . . I follow people who are experts in my field so I just learn from them [Commerce, G2, line 380-381].

This indicates that students were privileging living experts above more static textbooks. However, students were not contributing to the tweets.

(vi) Use of SlideShare, iTunes, TedTalk and blogs

Although there was a positive correlation between the Commerce course and use of SlideShare, iTunes and TedTalks ($p<0.05$), there was no mention of use of these resources in the qualitative data. Regarding blogs, one Commerce student acknowledged that if a blog came up while she was searching for learning resources for the Economics course, she would use it, although she preferred using the resources on the lecturer's list:

> I think . . . it depends on . . . I don't really, go for blogs . . . if there is something that you know is reliable … Blogs can be a good source . . ., but I'd better go for something reliable and try to rather be efficient [in terms of time] [Commerce, G1, line 240-241].

However, although this student used blogs, she questioned their reliability. Another student who was pessimistic about blogs argued that he neither used them for learning nor personal purposes (more discussion on this in Section 5.4.3.7).

(vii) Use of Khan Academy

Three Commerce respondents reported that they used the open content repository, Khan Academy. One of them said that she had heard about Khan Academy in passing while she was at high school and then again at UCT so she was using the Khan Academy YouTube channel[23] to find learning videos:

[23] https://www.youtube.com/user/khanacademy

> I heard about it in passing last year in high school, I didn't pay attention to it but this year in . . . I can't remember what course it was . . . where someone mentioned something about Khan Academy and how you . . . could just Google search certain subjects that you are struggling with and . . . people upload videos and stuff like that . . . I can't remember whether it's a university or a professor from a university that does all these videos . . . so yes, I've been using Khan Academy [Commerce, G2, line 361-366].

The other two said that they used Khan Academy because 'it is an international site' that is 'legit' [Commerce, G1, Line 203; line 98].

A Humanities respondent indicated that Khan Academy was recommended to her by a friend from another course. She found this to be a useful resource that improved her understanding of course content:

> I understand the videos in Khan Academy more than the lecture because I can pause the video and if I don't understand I can play it repeatedly. If I don't understand in the lecture theatre, there are few chances that I will understand again because the pace is fast [Humanities, G2, line 138-140].

The above excerpts demonstrate that students used Khan Academy resources for enhancing learning. This suggests that students make decisions based on their need for supplementary learning materials. However, their choices are based on international reputation, rather than on whether the resources are legally 'open' or not.

(viii) Use of e-books

Five respondents from Humanities reported that they used e-books. One said that their lecturer posted a book[24], that he had authored as an e-book, and so they accessed it at no cost. However, it seems that this student did not differentiate between an e-book and an open textbook which is a form of OER. The book he was referring to, was an open textbook hosted on OpenUCT. Furthermore, one of them also reported that she, together with her classmates, accessed a prescribed novel which is an e-book. The other three used Play Store on their mobile devices to search e-books and read them on their devices. It was clear that the students used e-books to avoid costs of hardcopy textbooks. For instance, the one who used the novel expressed the view that it was not worthwhile buying a novel that she was going to use for one semester in her course, and the other three said that they used the bits of the e-books that were displayed on GooglePlay.

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[24] https://open.uct.ac.za/bitstream/handle/11427/2415/Stealing Empire.pdf?sequence=1

One student said:

> There are eBooks in GooglePlay but they are for sale; they have prices and you have to use your card to buy them, but what I do, I get free samples. Free samples usually have a quarter of the whole book. So, I get to use those quarter pages only . . . For all my books, I have just quarter pages, not full books [Humanities, G1, line 289-292].

(ix) Use of in-class lecture recordings

Two Humanities students said that they watched videos of in-class lecture recordings to improve their understanding of concepts. However, this was for other courses and not this particular Humanities course. One of them said:

> Participant: . . . And lecture videos, . . ., I also find them useful or helpful because, let's say you don't understand something and then you watch it again and again and you start realising that he actually meant this.
> Researcher: That's the in-class lecture recording?
> Participant: Yes.
> Researcher: You've got some classes that are recorded?
> Participant: Yes. So, if you missed a point and you want to know what it was about, you can go to your lecture videos and play it again and again until you get the point [Humanities, G2, line 145-151].

That is, students also make use of in-class lecture recordings in instances where lecture venues are equipped with recording facilities.

Student age and gender, and use of online resources

In terms of age differences and use of online resources, on one hand, a larger percentage of those 18 years old or younger searched for information using search engines (92%), Wikipedia (58%), OER Institutional repositories (38%) and SlideShare, iTunes, TedTalks (31%), compared to those between 19 and 22 years.

On the other hand, a larger percentage of those aged between 19 and 22 years searched for information using YouTube (78%), OER directories (20%), blogs (19%) and other resources, compared to those of 18 years old or younger (Figure 5.61).

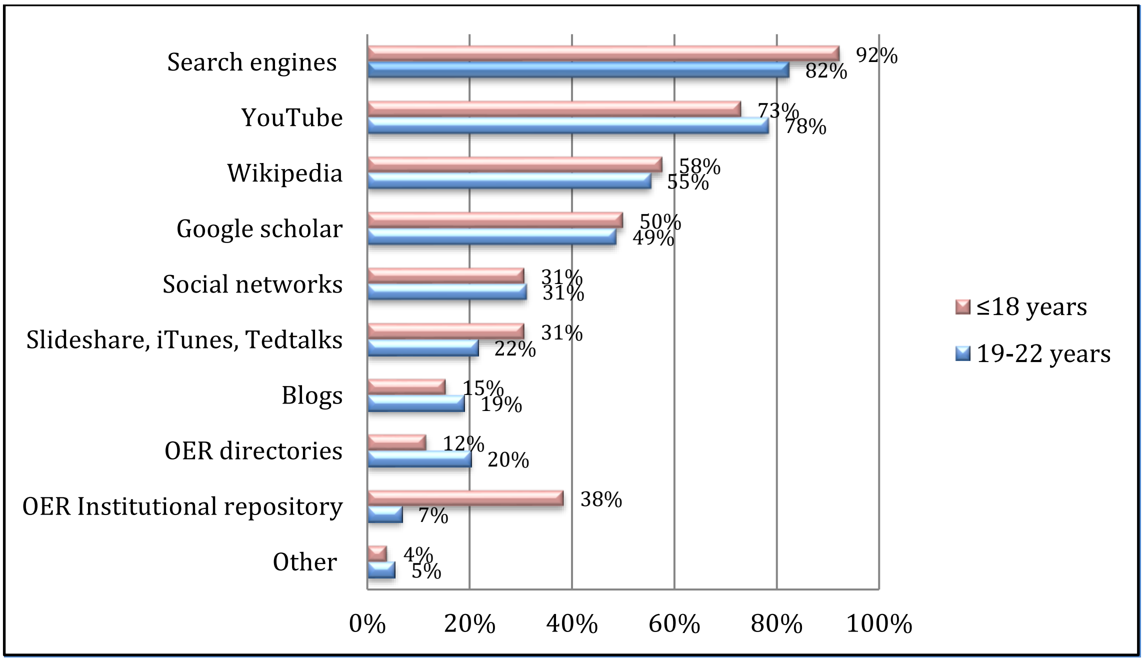


Figure 5.61: Age and search for online resources

There were minor differences in student use of Google Scholar (50% for the ≤18 year olds and 49% for the 19-22 year olds). There was no difference for both age groups regarding use of Google Scholar. Furthermore, a Chi-Square test found that there was a strong relationship ($p < 0.05$) between age and use of OER institutional repositories. Interestingly, the quantitative data reveals that all those between 19 and 22 years (5) were from Commerce and had heard about the concept of OER in a tutorial session (2), a lecture (2), and orientation/induction; tutorial session; peers; library information; course website/LMS; web searches (1). Also, one of those who was 18 years or younger who came from Commerce learnt about this in the Course website/LMS. However, the other two Commerce students and seven Humanities students who were 18 years or younger had never heard about the concept of OER. This implies that these nine students didn't know what OER was, but may have been guided by the examples that were provided in the questionnaires. This is evident in the qualitative data because even those students who said that they used Khan Academy resources did not know about the concept of OER.

Regarding gender, there is a significant difference in the use of Wikipedia; a larger percentage of females (60%) than males (49%) searched for information on Wikipedia (Figure 5.62).

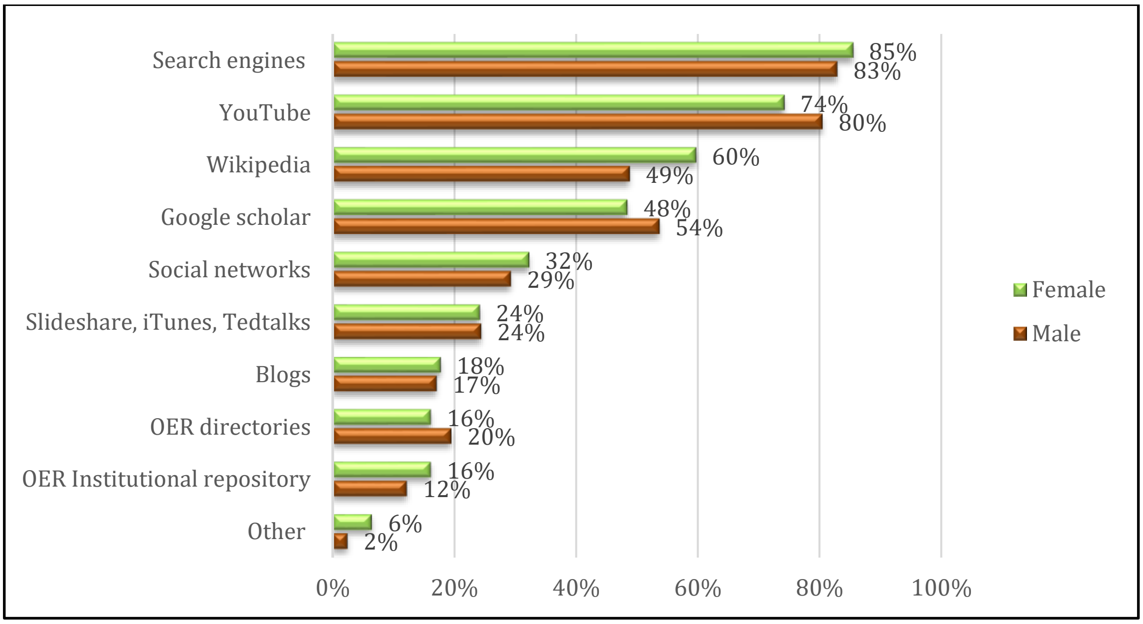


Figure 5.62: Gender and search for online resources

A larger percentage of females used social networks (32%), OER institutional repositories (16%) and other resources (6%) compared to males, while a larger percentage of males used YouTube (80%), Google Scholar (54%) and OER repositories (20%) compared to females. There are small differences in the use of blogs (18% of females and 17% of males) and none for SlideShare, iTunes, Tedtalks (24% for both females and males). There is no correlation between gender and use of resources.

With respect to student enrolment in a computing-related subject, 100% of those students who enrolled in a computing-related subject whilst in high school searched for learning information on YouTube (Figure 5.63).

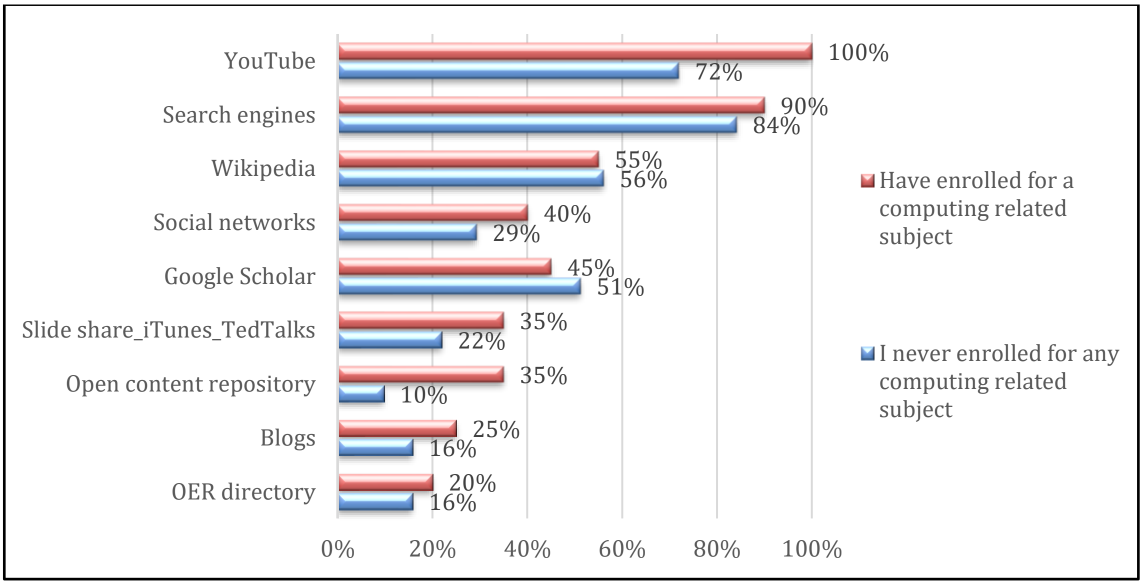


Figure 5.63: Enrolment in a computing-related subject and search for online resources

Generally, higher percentages of those students who enrolled in a computing-related subject whilst in high school than those students who did not do so, searched for online learning information. However, a higher percentage of those students who had never enrolled in any computing-related subject whilst in high school than those students who had done so, searched for learning information on Google Scholar (51%). A Chi Square test revealed that there was a significant correlation ($p<0.05$) between enrolling in a computing-related subject whilst in high school and searching for information on YouTube and in open content repositories.

5.4.3.4 Curating and managing information

Students were asked which social bookmarking systems they used for keeping record of the online resources, that they might like to share with others and were asked to tick all the options applicable to them such as Delicious, Pinterest, Diigo and Evernote (Appendix A, Question 18). The data revealed that the participants, if at all, used Pinterest, Evernote, Delicious and Diigo.

Participants also indicated that they used other bookmarking systems and this turned out to be more frequently used than these others (Figure 5.64).

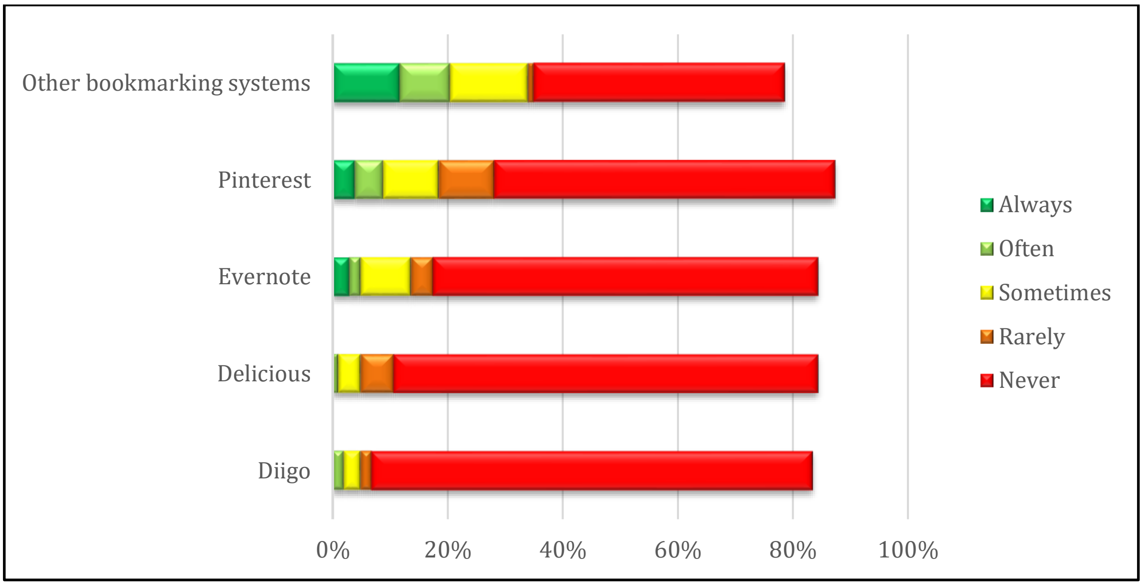


Figure 5.64: Student use of bookmarking systems

The most frequently used social bookmarking system (as per the examples in the questionnaire) was Pinterest (29% of participants). The data further revealed that most participants (36%) used other bookmarking systems; two of these wrote that they used ‘Bookmark’ on the internet browser. The data also reveals that 24 participants did not use any bookmarking system. This means that these participants did not manage or curate the resources they found online on an online bookmarking system. Although this was not a course requirement, the quantitative data reveals that 65 students (63%) managed or curated online learning resources. Additionally, a course break-down illustrated that more respondents from the Commerce course (31%) than the Humanities course (27%) used Pinterest.

Furthermore, the data also revealed that there was no difference in use of Pinterest in terms of age (27% for $\leq$ 18 years and 29% for 19-22 years) whereas, regarding gender, there was an observable difference of 35% of females and 17% of males respectively using Pinterest. Regarding student enrolment in a computing-related subject whilst in high school, a higher percentage (29%) of those students who did not enrol in any computing-related subject than those who did so, bookmarked their resources using Pinterest.

5.4.4 Social-emotional dimension of digital literacy practices

This dimension involves students safeguarding their digital footprint. This is demonstrated by students Googling their names to check what is out there on the internet about them (Figure 5.65).

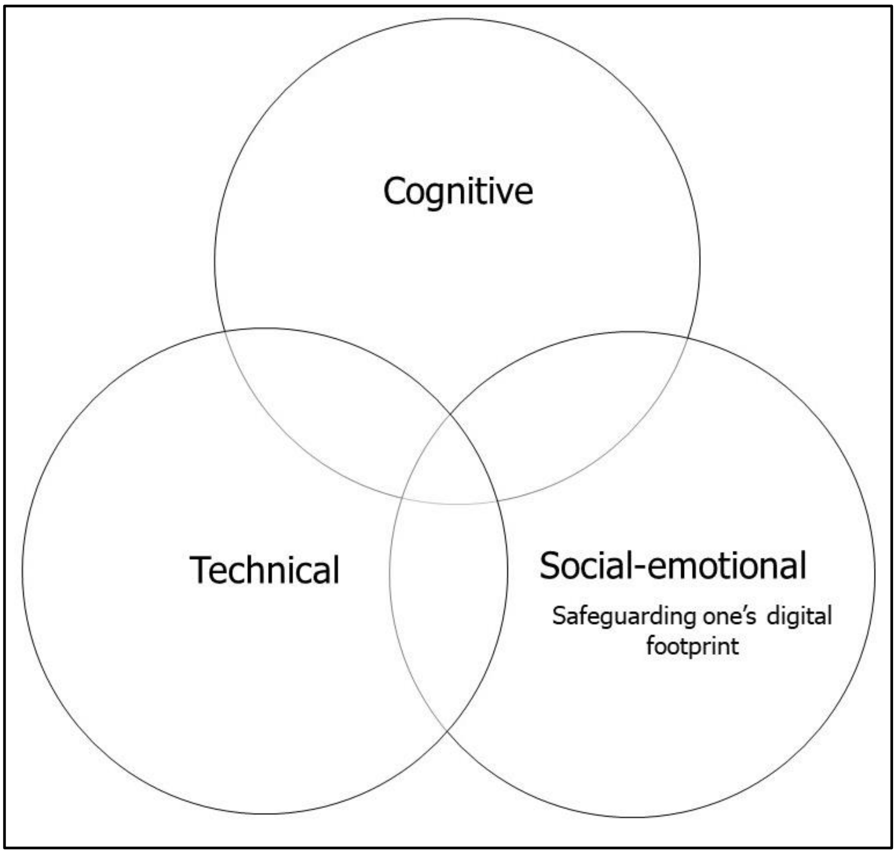


Figure 5.65: Student digital literacy practices in the social-emotional dimension

When students from both courses were asked to indicate how frequently they Googled their names to see what was on the internet about them (Appendix A, Question 21), the responses indicate that 17% of students always Google their names while, 26% of the students never do so.

There was no difference between the two age ranges with respect to this social-emotional practice (Figure 5.66).

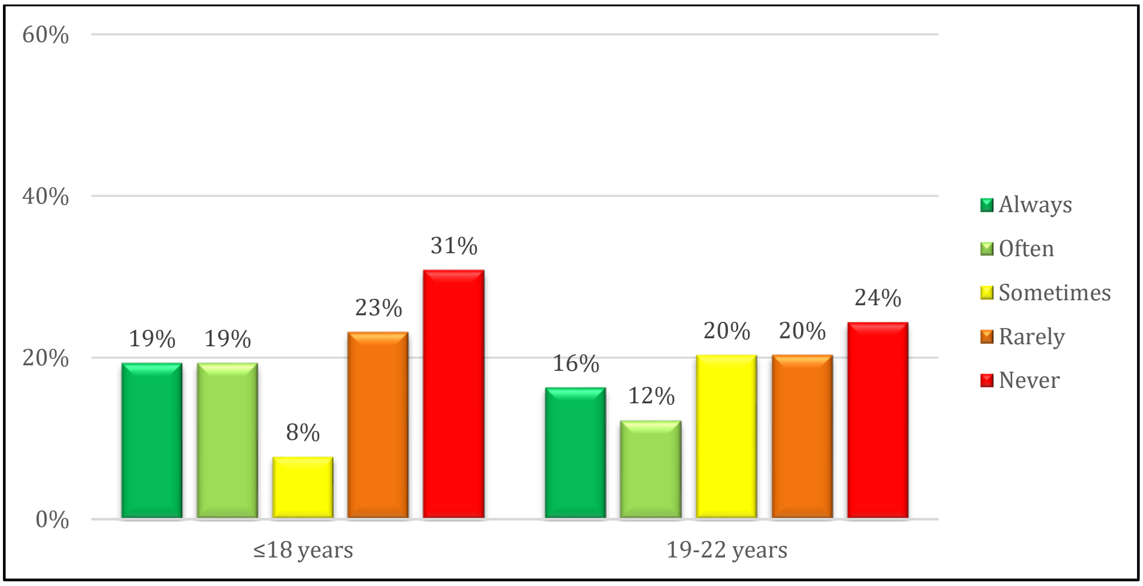


Figure 5.66: Age and social-emotional practices

With respect to gender, a higher percentage (20%) of male students than female students always Googled their names to see what was on the internet about them, while a higher percentage of female students never did so (Figure 5.67).

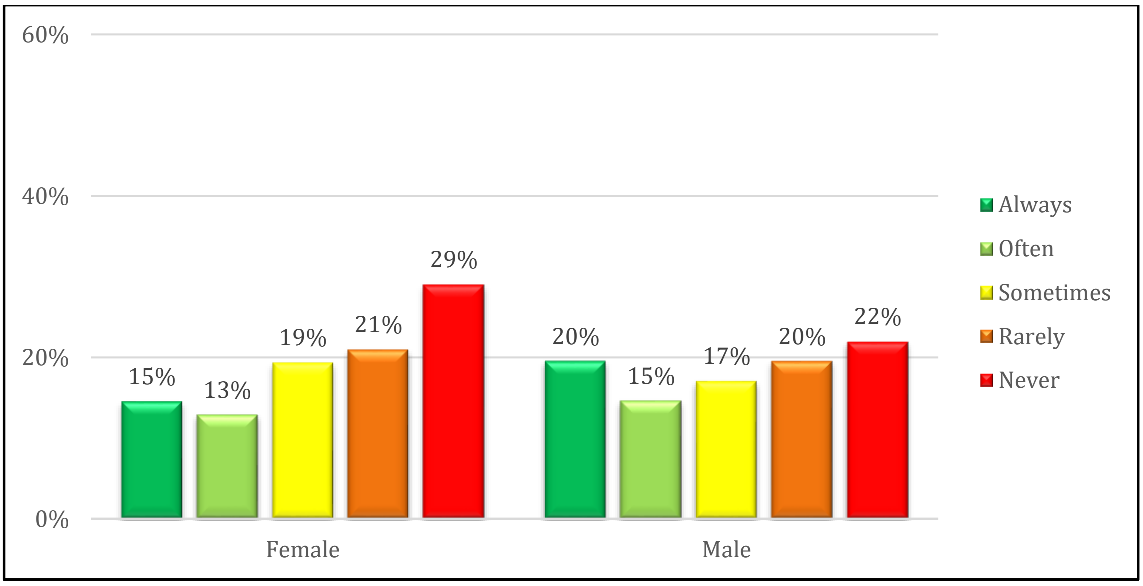


Figure 5.67: Gender and social-emotional practices

Furthermore, a higher percentage (18%) of those students who enrolled in a computing-related subject whilst at high school always Googled their names to see what is on the internet about them compared to those who never enrolled for any computer-related subject (Figure 5.68).

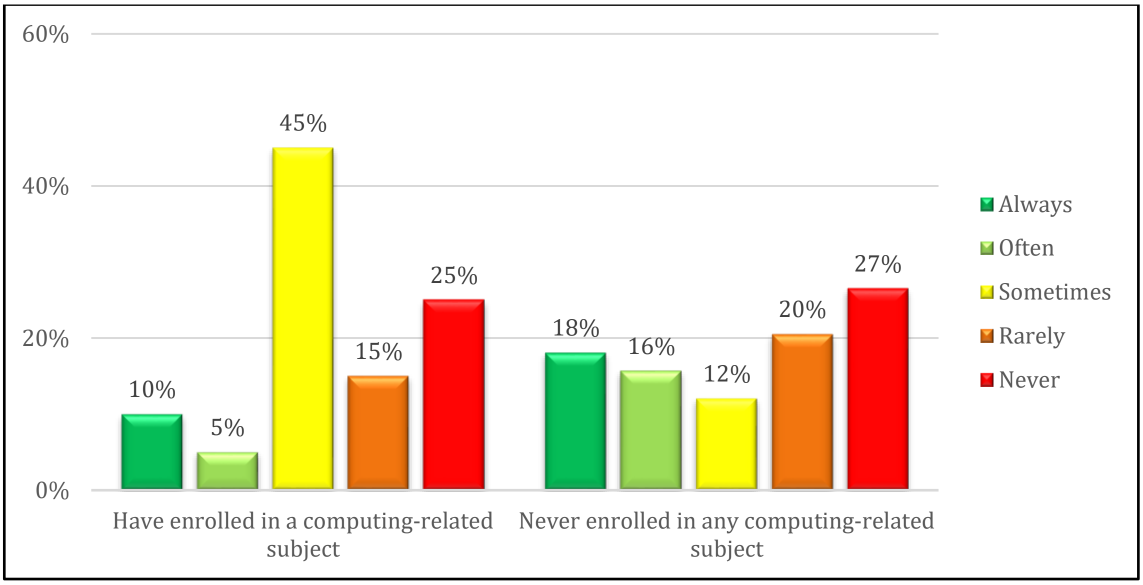


Figure 5.68: Enrolment in a computing-related subject and social-emotional practices

The above discussion suggests that male students and those who had enrolled in computing-related subjects while in high school were more aware of their digital footprint than female students and those who had not taken a computing-related subject.

5.4.5 Technical and socio-emotional dimension of digital literacy practices

Digital literacy practices in this dimension, as presented below, involve the effective use of social media for study-related and social networking purposes. It is important to note that for neither course was the use of social networking tools a course requirement. Practices in this dimension include communicating using instant messaging (IM) or chat technologies, microblogging, establishing professional and personal networks, and protecting oneself online (Figure 5.69).

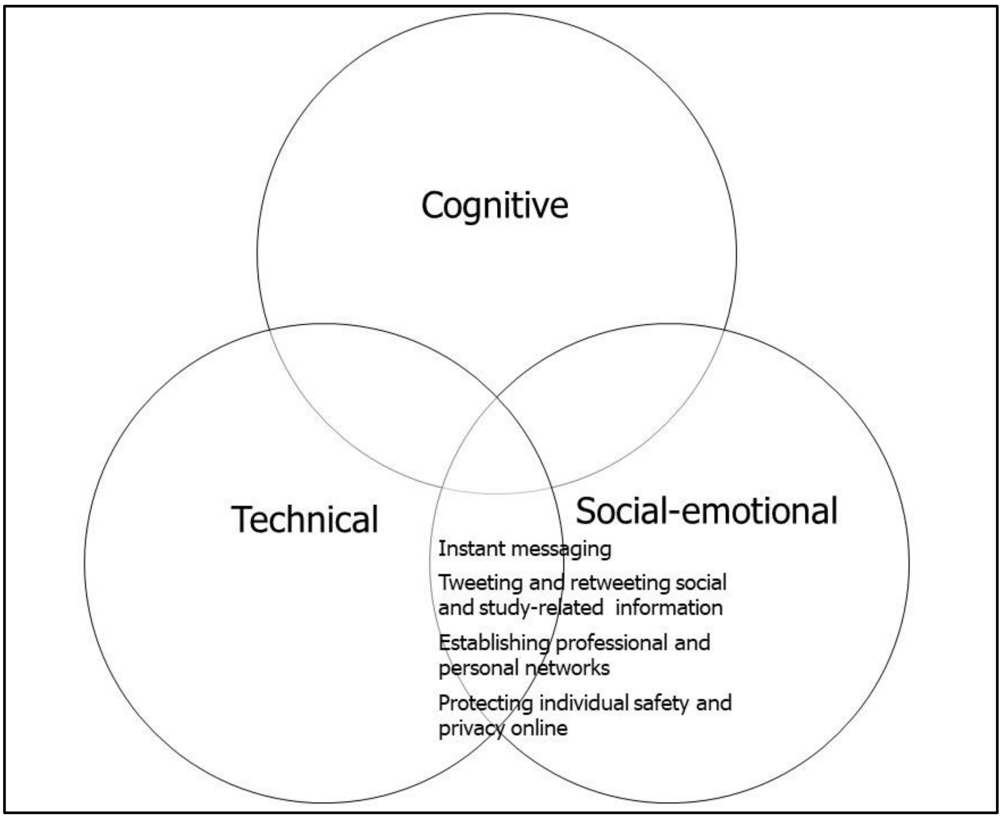


Figure 5.69: Student digital literacy practices in the technical and social-emotional dimension

5.4.5.1 Communicating using instant messaging or chat technologies

Students were asked to indicate what instant messaging or chat technology they used and whether that was for study, personal or both study and personal communication purposes (Appendix A, Question 22). The data revealed that the primary technology used for both study and personal communication purposes was WhatsApp (Figure 5.70).

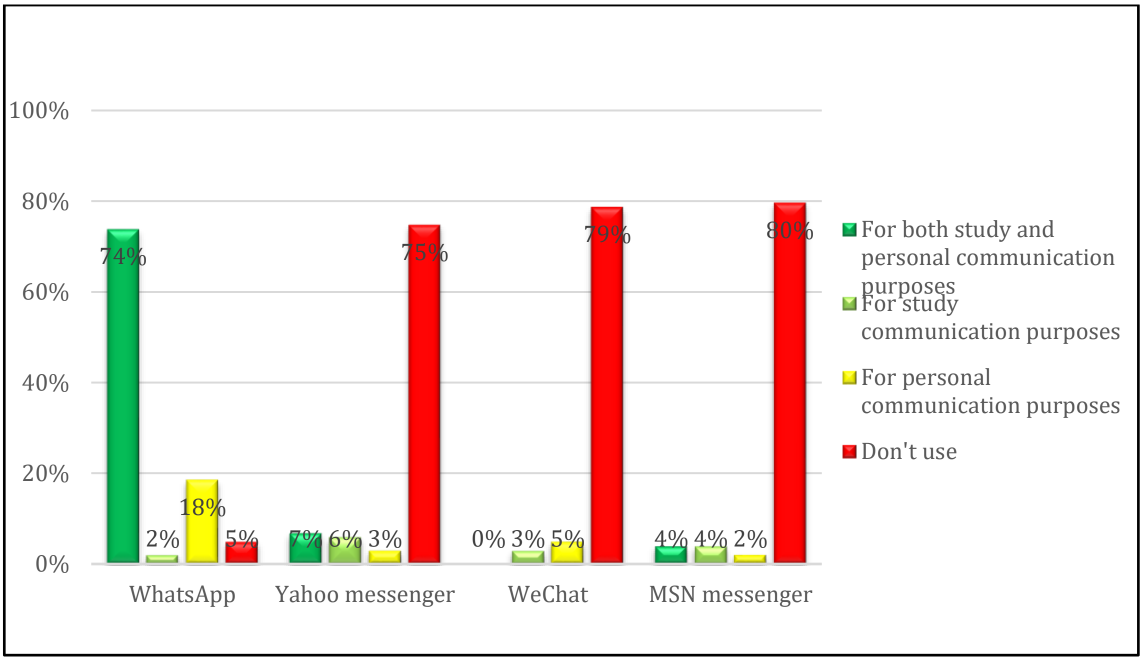


Figure 5.70: Student use of instant messaging technologies

Almost all (95%) of the respondents used WhatsApp; 74% used it for both study and personal communication purposes, 18% used it for personal communication purposes and only 2% used it for solely study-related communication purposes. Only 5% (n =5) of the participants did not use WhatsApp. One of these students used Yahoo messenger for study communication purposes and another one used MSN messenger personal communication purposes. The quantitative data also revealed that there was no difference in terms of courses; the data demonstrated that in both courses, a large percentage of students used WhatsApp for both purposes (74% in the Commerce course and 73% in the Humanities course), followed by use for personal purposes (18% in Commerce course and 19% in the Humanities course) and a very small percentage (3% in the Commerce course and 2% in Humanities course) used WhatsApp for study purposes only. Additionally, the qualitative data revealed that only two respondents (one male from Commerce, one female from Humanities) used MixIt for instant messaging.

Regarding use of WhatsApp for study purposes, the qualitative data revealed that WhatsApp groups were structured differently between the two courses. On one hand, Commerce students formed WhatsApp groups based on their tasks' groups, with four Commerce respondents maintaining that they used WhatsApp for communicating to enable their learning. These students used the WhatsApp groups for communicating, discussing and sending screenshots, links and images for their course tasks (see Section 5.5.1.1 and 5.5.1.4). On the other hand, two respondents from Humanities indicated that some of their courses had WhatsApp groups where students discussed course work and shared course-related resources. However, one student repeatedly emphasised that she was not a fan of WhatsApp and had always associated WhatsApp as personal IM technology that was distracting, consequently reported that she was inactive in their course's WhatsApp group. Additionally, one of these respondents also reported that she was part of a residence WhatsApp group that discussed course work (as they are accommodated according to their faculties in the residences).

Furthermore, some respondents from both courses used WhatsApp for personal purposes. Four participants from each of the two courses reported that they formed groups where they communicated, shared pictures and YouTube video links with friends and family members. One rare case in Commerce was that the respondent shared picture (program) code with friends for personal purposes. Furthermore, one Humanities respondent was part of social groups such as friend groups, football club groups and choir members where they shared texts, images and YouTube videos.

In terms of age, a larger percentage (80%) of those between 19 and 22 years communicated using WhatsApp for both study and personal purposes when compared to those 18 years old or younger. Additionally, a larger percentage of those 18 years old or younger (35%) used WhatsApp for personal purposes than those between 19 and 22 years old (12%) (Figure 5.71).

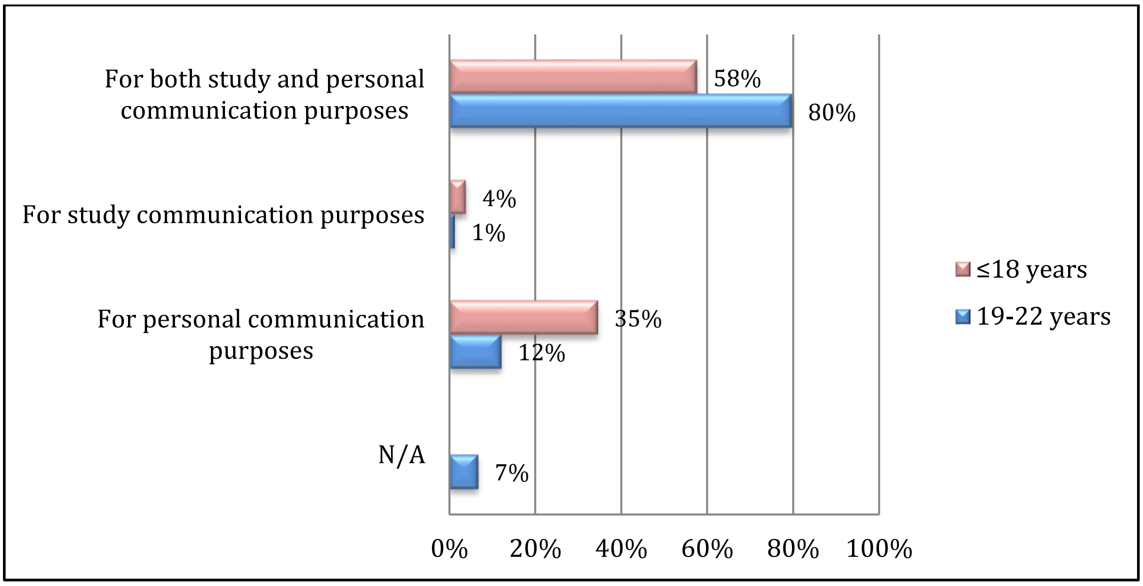


Figure 5.71: Age and use of WhatsApp

There are small differences in percentage in terms of gender, with a higher percentage (77%) of females than that of males (68%) using WhatsApp for both study and personal communication purposes, and a higher percentage of males (24%) than that of females (15%) using it for personal purposes (Figure 5.72).

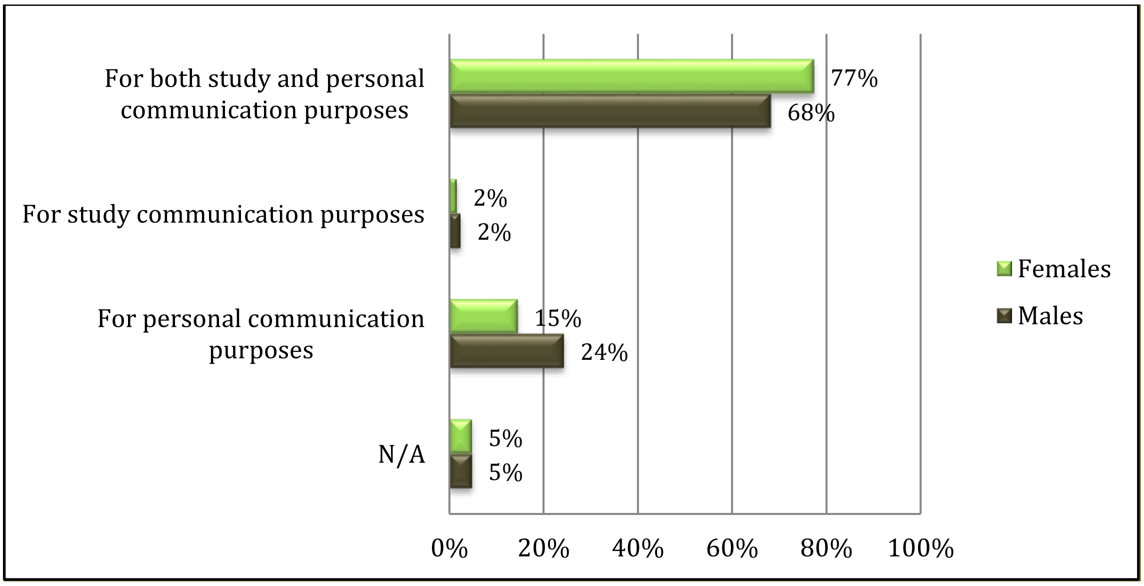


Figure 5.72: Gender and use of WhatsApp

With respect to enrolment in a computing-related subject whilst at high school, there is no noticeable difference between the two groups of students in terms of instant messaging for both study and personal purposes (Figure 5.73).

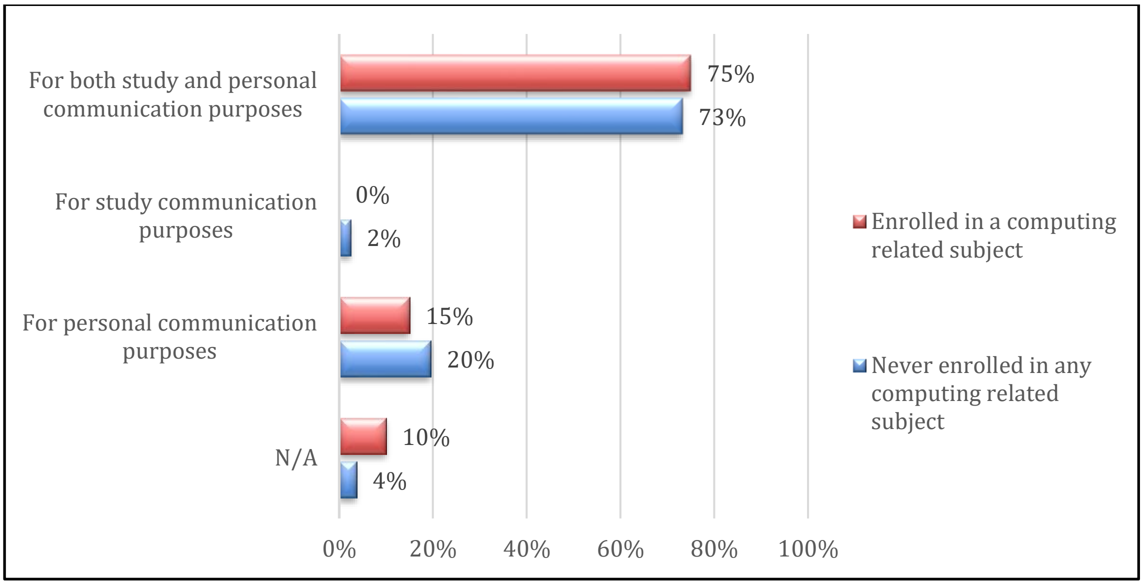


Figure 5.73: Enrolment in a computing-related subject and use of WhatsApp

More of those students, who had never enrolled in a computing-related subject than those who did so, communicated via WhatsApp for personal purposes only. Also, a higher percentage (10%) of the latter group did not use WhatsApp at all.

In short, higher percentages of the older students and female students used WhatsApp for both study and personal purposes when compared to the younger students and male students, respectively; whereas there was no discernible difference between those students who enrolled in computing-related subjects and those students who did not do so.

5.4.5.2 Tweeting and retweeting social and study-related information

Students were asked to indicate what their activities were on a microblogging platform, Twitter (Appendix A, Question 19). Most respondents (62%) posted social information (Figure 5.74).

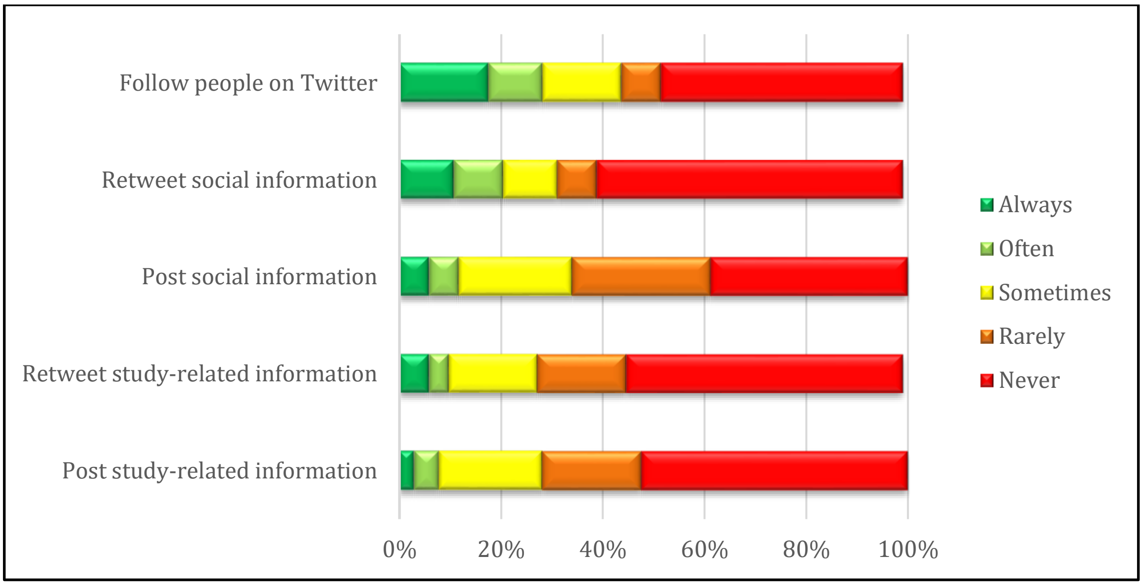


Figure 5.74: Student microblogging activities

In descending order, 17% of the participants always followed other people on Twitter, followed by the practices of retweeting social information (11%), posting social information (6%), retweeting study-related information (6%) and posting study-related information (3%). Also, the quantitative data reveals that a relatively large percentage of the participants (30%) did not use Twitter at all.

With respect to courses, higher percentages of Humanities students tweeted (49%) and retweeted (47%) study-related information when compared to the Commerce students who tweeted (46%) and retweeted (41%) study-related information. The qualitative data reflects that two Commerce students followed experts in their study fields, while four students from both courses indicated that they used Twitter for personal purposes such as following public speakers (one from Humanities) and celebrities (one from Commerce) to keep up-to-date with what they posted, keeping up-to-date with what was happening out there because they didn't have television in the residence (one from Commerce), and checking on Bible quotes that people posted (one from Commerce). Only this last respondent reported that she seldom tweeted social information and has since stopped using Twitter because she believed it is for people who constantly tweet. These responses indicate that the other three students mainly read what other people tweeted.

With respect to age, although there is no noticeable difference in terms of the practice, more of those between 19 and 22 years tweeted social- (61%) and study-related information (49%) than the 18 years old or younger who posted social- (58%) and study-related information (47%). However, a higher percentage (50%) of the younger students than the older students (40%) retweeted study-related information.

In terms of gender, a higher percentage of males than females followed people (58%) and retweeted study-related information (47%), while a higher percentage of females than males posted social- (62%) and study-related (51%) information on Twitter.

With respect to enrolment in a computing-related subject, higher percentages of those students who enrolled, tweeted (55%) and retweeted (50%) study-related information when compared to those who did not do so. Forty-seven per cent of those students who had never enrolled tweeted and 44% of them retweeted study-related information. The above discussion suggests that more of the older students, female students and those who enrolled in a computing-related subject tweeted study-related information, when compared to the younger students, male students and those students who had never enrolled in a computing-related subject.

5.4.5.3 Establishing professional and personal networks on social networking sites

Students were asked to indicate the social networking sites (SNS) they had used for establishing professional (study-related) learning, personal networks or both (Appendix A, Question 20). The data demonstrates that out of the four social networking sites (SNS), Facebook and Google+ are the most used when compared to LinkedIn and MySpace (Figure 5.75).

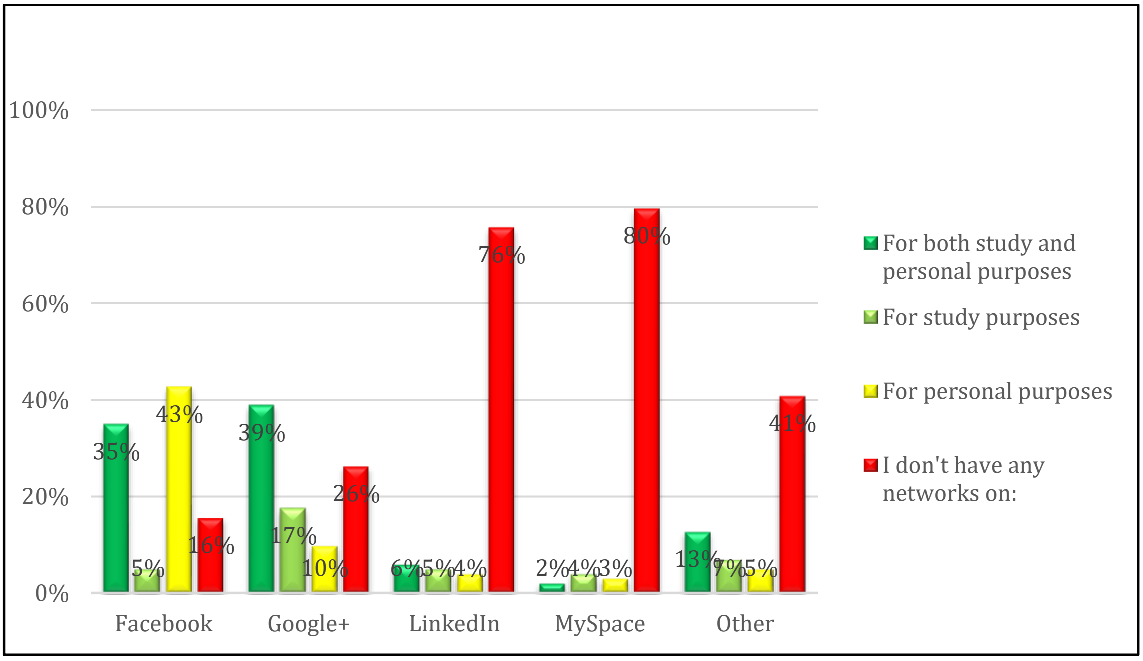


Figure 5.75: Student use of social networking sites

Regarding the predominantly used SNS, Facebook, the highest percentage (43%) of students used it for mainly personal purposes (establishing personal networks). The qualitative data also reveals that 13 participants from both courses used Facebook for personal purposes such as Facebook messaging, browsing through other people's posts, watching videos, to 'like' others' pictures, sharing their pictures and getting reminders about people's birthdays. Two respondents (one female from each course) said that they regularly followed the UCT Facebook page to keep up-to-date with the latest at the university. Two of these (from Commerce) students were also adamant that Facebook could only be used for personal purposes:

Participant 1: . . . Facebook is also good because it keeps you up to date with what's happening.
Researcher: . . . there are professional sites where people would be sharing information regarding a particular topic…so you make use of Facebook. . ..
Participant 1: Yes.
Researcher: But you just feel that's for personal use?

Participant 1: You can't go to Facebook for research.
Participant 2: Ja, for personal use [Commerce, G1, line 253-260].

Regarding disciplines, a higher percentage (47%) of Humanities students than Commerce students (36%) used Facebook for personal purposes while a higher percentage (23%) of Commerce students did not use Facebook at all (Figure 5.76).

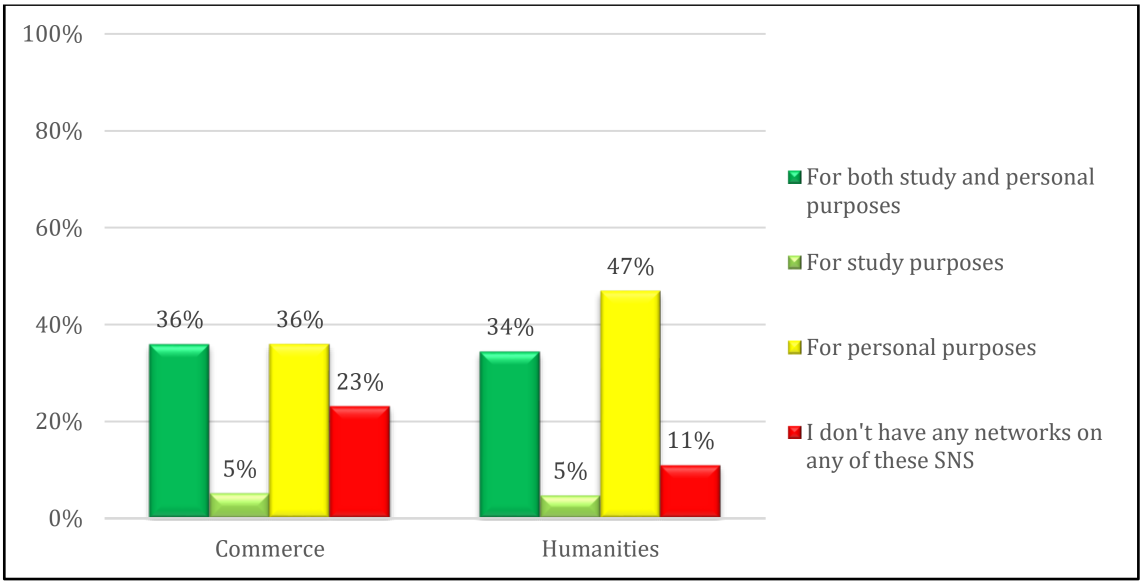


Figure 5.76: Disciplines and student use of Facebook

There was no discernible difference between the two disciplines in student use of Facebook for both study and personal purposes.

Regarding age, a higher percentage (50%) of the younger students than the older students primarily used Facebook for personal purposes (Figure 5.77).

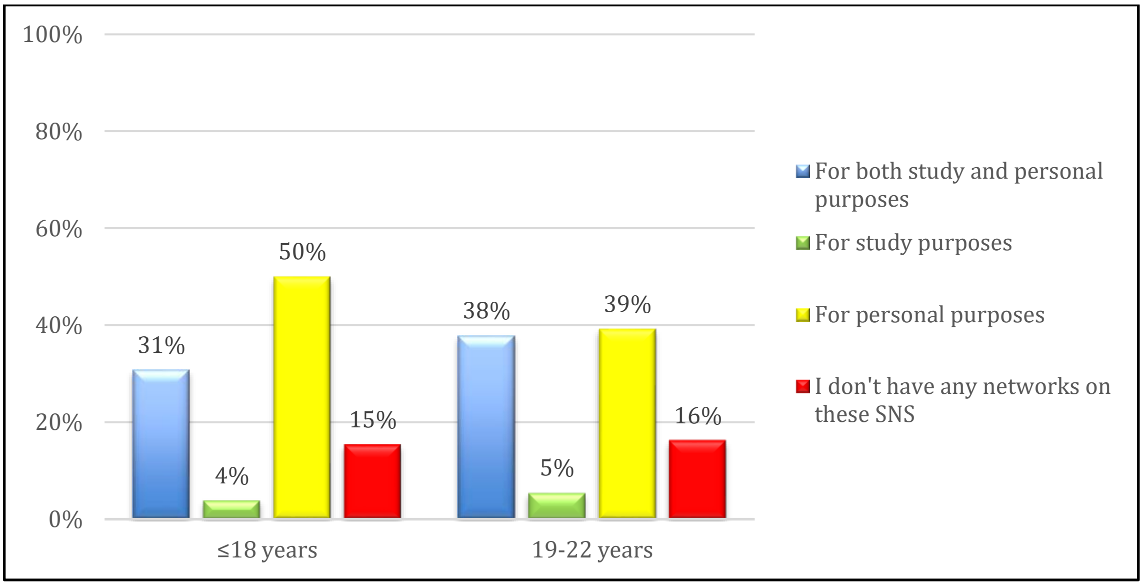


Figure 5.77: Age and use of Facebook

A higher percentage (38%) of those students between 19 and 22 years old used Facebook for both study and personal purposes when compared to those students who were 18 years old or younger.

Regarding gender, a higher percentage of females (45%) than males (39%) used Facebook for personal networks (Figure 5.78).

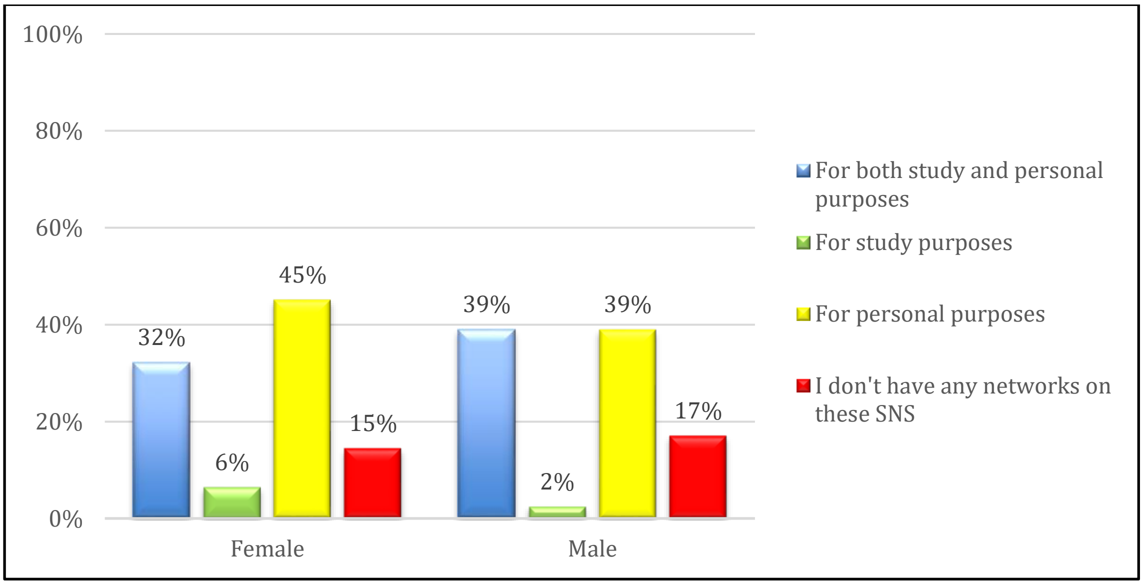


Figure 5.78: Gender and use of Facebook

A higher percentage (39%) of male students than female students used Facebook for both study and personal purposes. Although small percentages, more females (6%) than males (2%) used Facebook for solely study purposes.

With respect to student enrolment in computing-related subjects, a higher percentage (65%) of those students who had enrolled than those students who had never done so, used Facebook for primarily personal purposes (Figure 5.79).

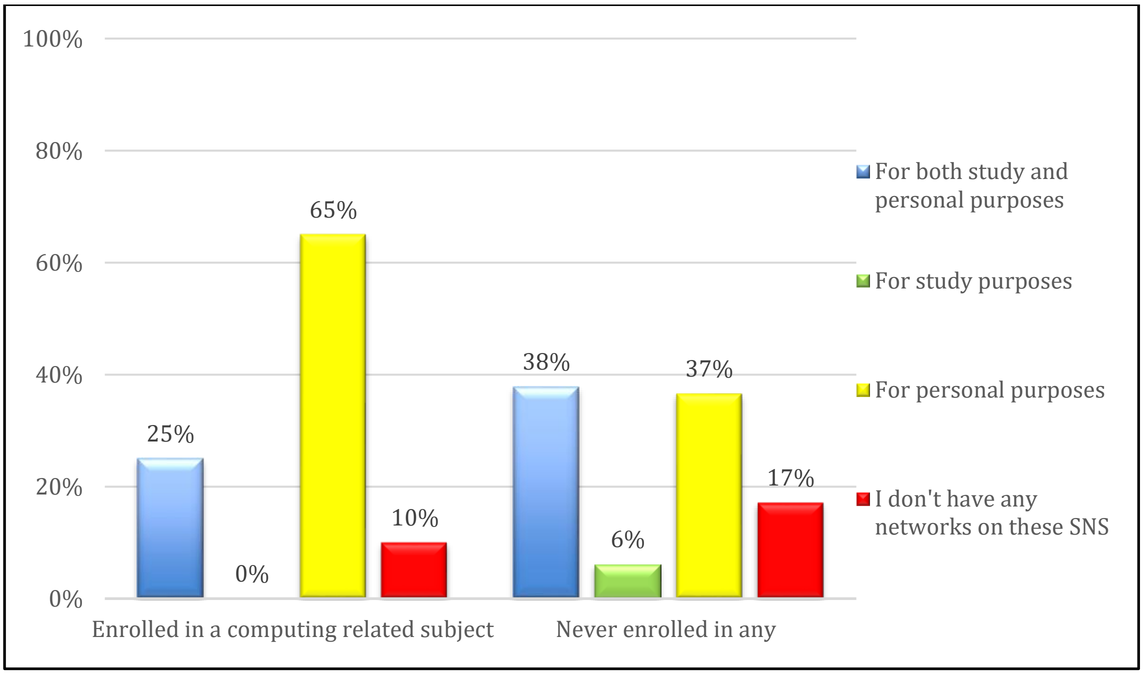


Figure 5.79: Enrolment in a computing-related subject and use of Facebook

A higher percentage (38%) of those students who had never enrolled in a computing-related subject used Facebook for both study and personal purposes and, at the same time, never (17%) used Facebook at all when compared to those who had enrolled. None of those students who enrolled in a computing-related subject used Facebook for solely study purposes.

The above discussion suggests that student use of Facebook for both study and personal purposes is influenced by age and gender, but not pedagogical aspects or student enrolment in computing-related subjects.

Interestingly, in the questionnaire, 39% of the participants indicated that they used Google+ for both study and personal purposes. However, with the qualitative data, there was no mention of Google+. Additionally, a low percentage of participants had established networks on LinkedIn, and the fewest used MySpace. In terms of LinkedIn, participants reported how they used LinkedIn for professional and personal networks. Two participants; one from each of the courses, reflected that they used LinkedIn to stay abreast of career-related opportunities. For instance, the Commerce respondent said:

> I use LinkedIn for career-focused stuff, maybe if I want to follow KPMG and see what they are doing . . . career paths to follow and stuff like that [Commerce, G1, line 273-274].

The Humanities respondent said:

> I don't know LinkedIn very much but what I use it for . . . I normally view people's profiles . . . maybe COOs, academics or people who give you strength when you read their stories . . . like COOs of companies or a person who holds a post that I would like to hold in the future . . . I get their views in LinkedIn [Course B, G1, line 159-162].

The above excerpts demonstrate that some students began thinking about and developing their professional identities as early as in their first year of study. However, the data also reveals that 10% of the participants did not have any networks on any of the four SNS.

5.4.5.4 Protecting individual safety and privacy online

A technical aspect is students' careful management of the privacy settings on their SNS. When students were asked to indicate how frequently they managed these (Appendix A, Question 21), their responses revealed that 83% always did, 11% sometimes did and 2% of students never managed the privacy settings of their SNS. This practice is not related to study use.

With respect to age, 100% of the younger students carefully manage the privacy setting on their social networks (Figure 5.80).

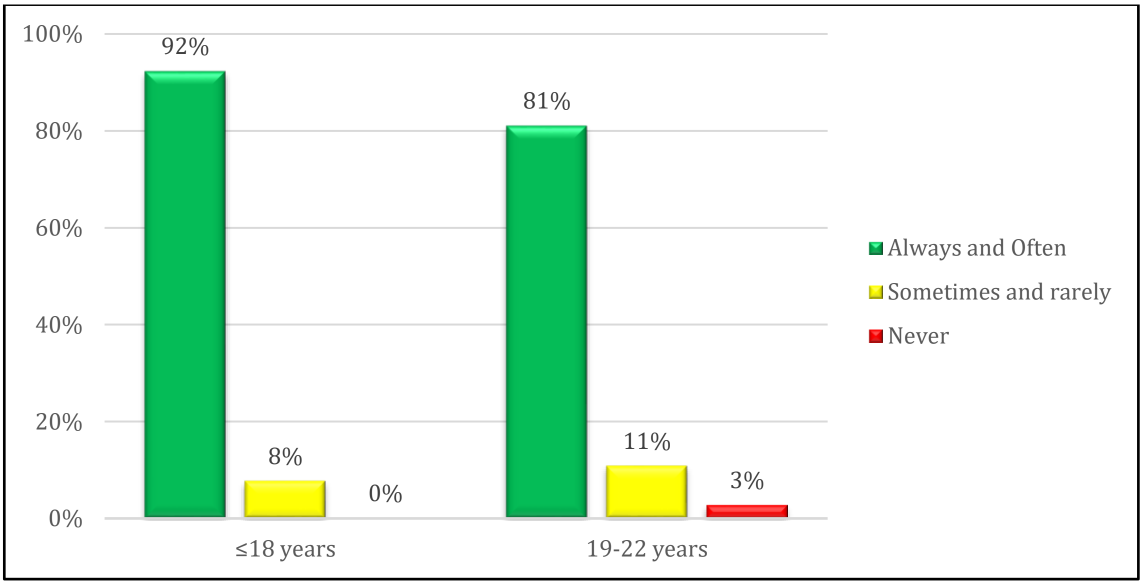


Figure 5.80: Age and management of a privacy setting

With respect to gender, all female students (97%) who responded to the question carefully managed the privacy setting on their social networks when compared to male students (Figure 5.81)

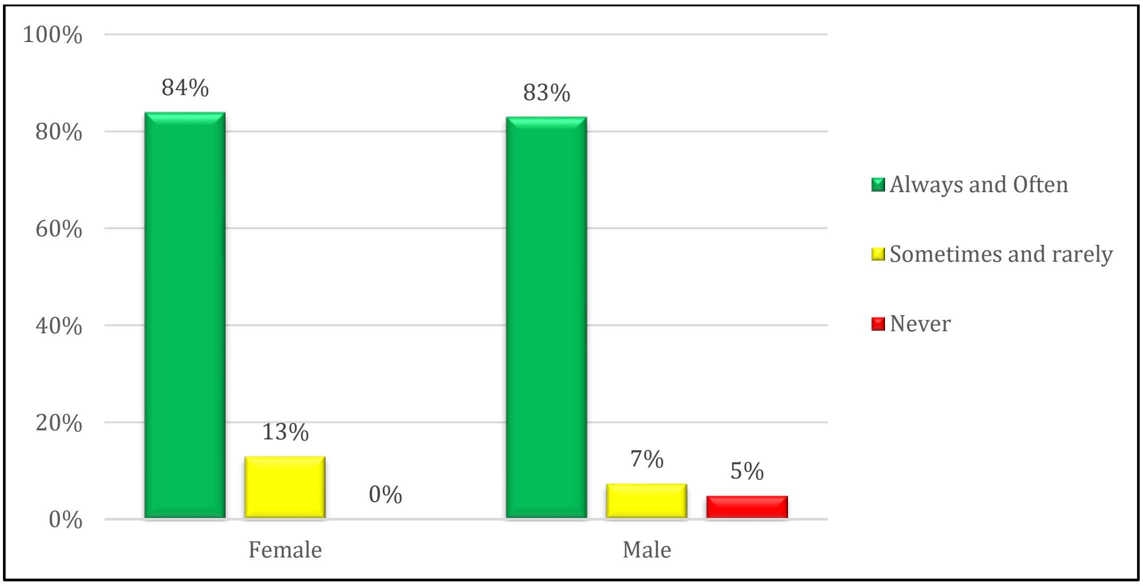


Figure 5.81: Gender and management of a privacy setting

Emanating from the qualitative data were mixed behaviours among four participants. Two students ensured that they maintained their safety by not revealing their personal information on social networks. One of these students said that she deliberately restrained from sharing personal information on Facebook:

> I don't like posting personal statuses or personal pictures on Facebook . . . They [people] can download it but . . . nothing will endanger me because it does not give much details like my house address, they can't say she lives here . . . [Commerce, Interview, line 236-237].

This indicates that this student is cautious about what she shares about herself on social networks. The other student reported that he created fake profiles on Facebook and LinkedIn and explained:

> I didn't know what LinkedIn is about. I just thought it was another social network or whatever. . .. I put my personal information there; telling them that I am at the Sand Dune University [Students in the room were laughing and this was an indirect indication that this was common practice for them] [Commerce, G3, line 409-410].

Although this is not good practice, this student sees this strategy as a way of protecting himself from people who could use information he has revealed about himself, to harm him. However, as is common practice, two other students reported that they each updated their status, and captured and posted pictures on Facebook (Commerce student) and Instagram (Humanities student) of places, whenever they travelled.

The above discussion demonstrates that all younger students and more female students than male students carefully managed the privacy settings on their social networks.

With respect to enrolment in a computing-related subject, a higher percentage (95%) of those who had never enrolled in any computing subject than those students who did so, carefully managed the privacy settings on their social networks (Figure 5.82).

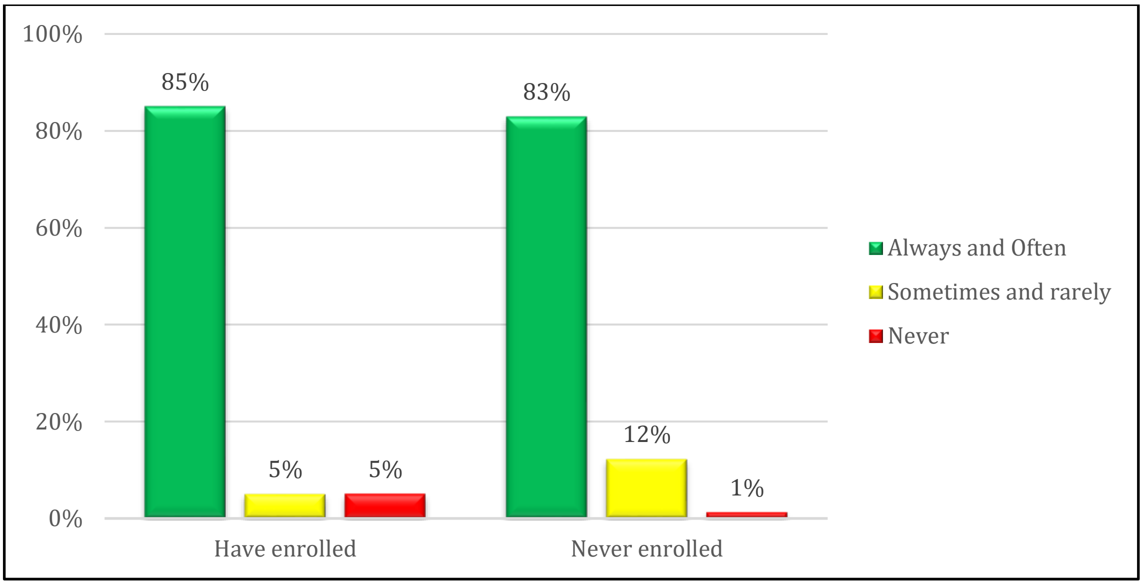


Figure 5.82: Enrolment in computing-related subjects and management of a privacy setting

5.4.6 Cognitive and social-emotional dimension of digital- literacy practices

This dimension involves collaboratively creating monomodal and multimodal resources, and managing a professional online profile. The latter includes presenting oneself online and managing social-emotional aspects, such as thinking about one's reputation when saying or doing something online, ensuring that what one posts online is suitable for his or her different networks, acting positively against other people's reputation-damaging online behaviours, acting positively against cyberbullying.

Figure 5.83 illustrates the practices in this dimension, as they are presented below.

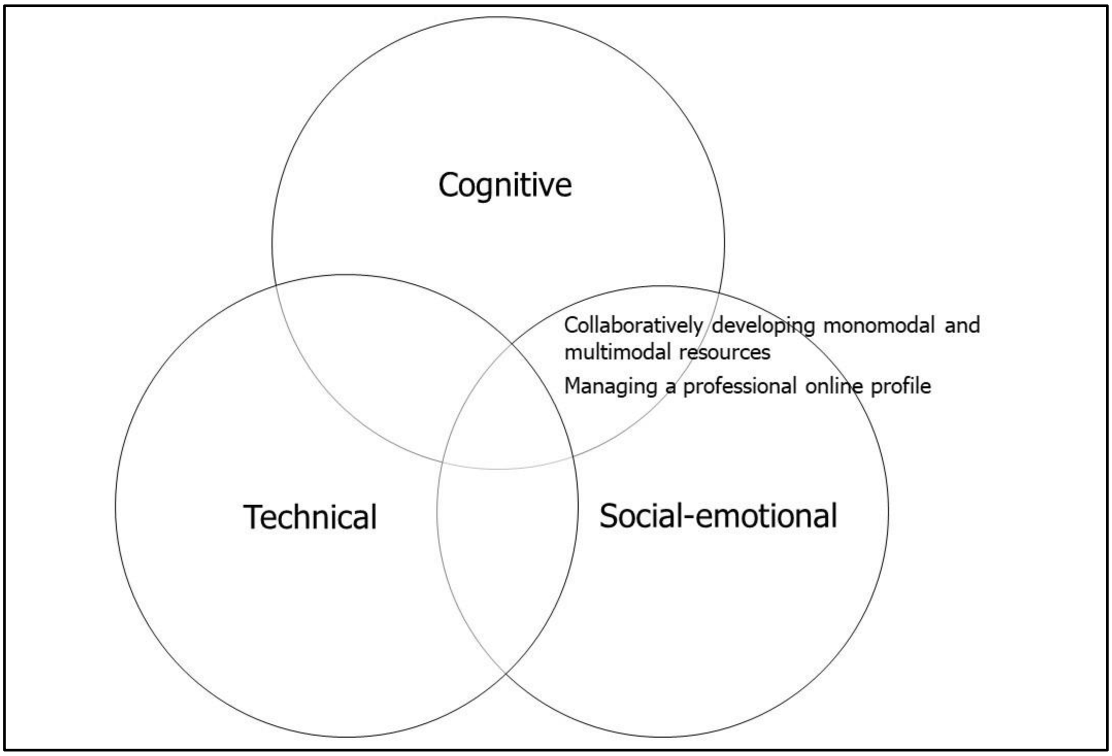


Figure 5.83: Student digital literacy practices in the cognitive and social-emotional dimension

5.4.6.1 Collaboratively developing monomodal and multimodal resources

Participants were asked to indicate, by ticking, whether they collaboratively developed resources using productivity software and Web 2.0 technologies (Appendix A, Question 23). Less than 20% of the Commerce and Humanities student collaboratively developed resources with their peers (Figure 5.84).

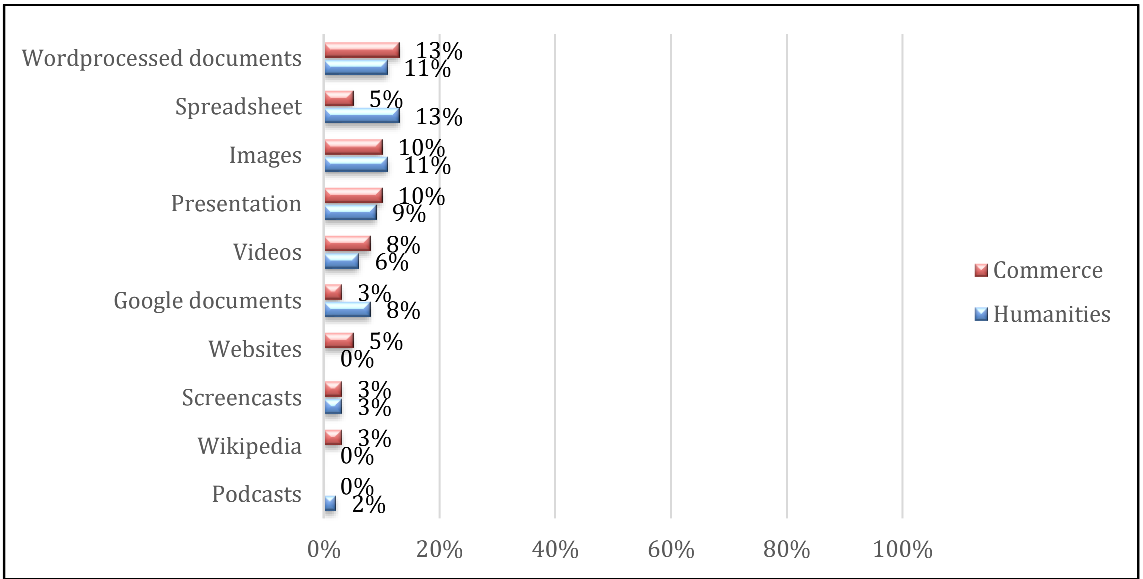


Figure 5.84: Disciplines and collaborative development of resources

Thirteen percent of both Commerce and Humanities students collaboratively developed word-processed documents and spreadsheets. No correlation was found between disciplines and collaborative development of digital resources. However, it is important to note that Commerce students only used Google documents for one of their learning activities, after the questionnaire was administered (as will be described in Section 5.5.).

With respect to age, less than 20% of both age ranges collaboratively developed resources with their peers (Figure 5.85).

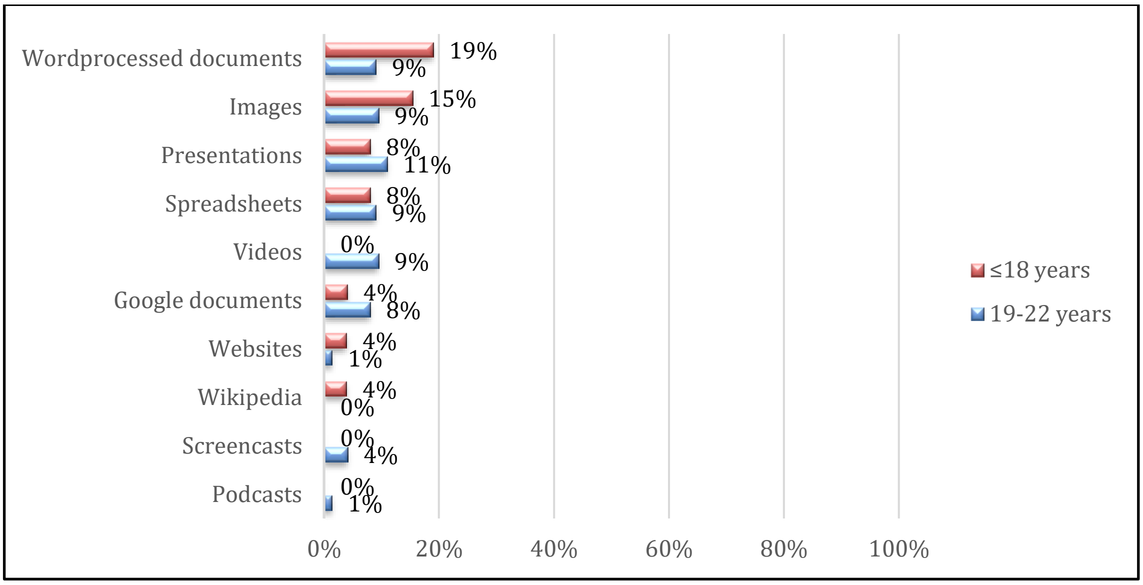


Figure 5.85: Age and collaborative development of resources

A higher percentage of the younger students than the older students collaboratively developed word-processed documents (19%) and images (15%). None of the younger students collaboratively developed videos with their peers. No correlation was found between age and collaboratively developing resources.

Regarding gender, more (13%) female students than male students collaboratively created word-processed documents; whereas more (12%) male students than female students collaboratively developed images with their peers (Figure 5.86).

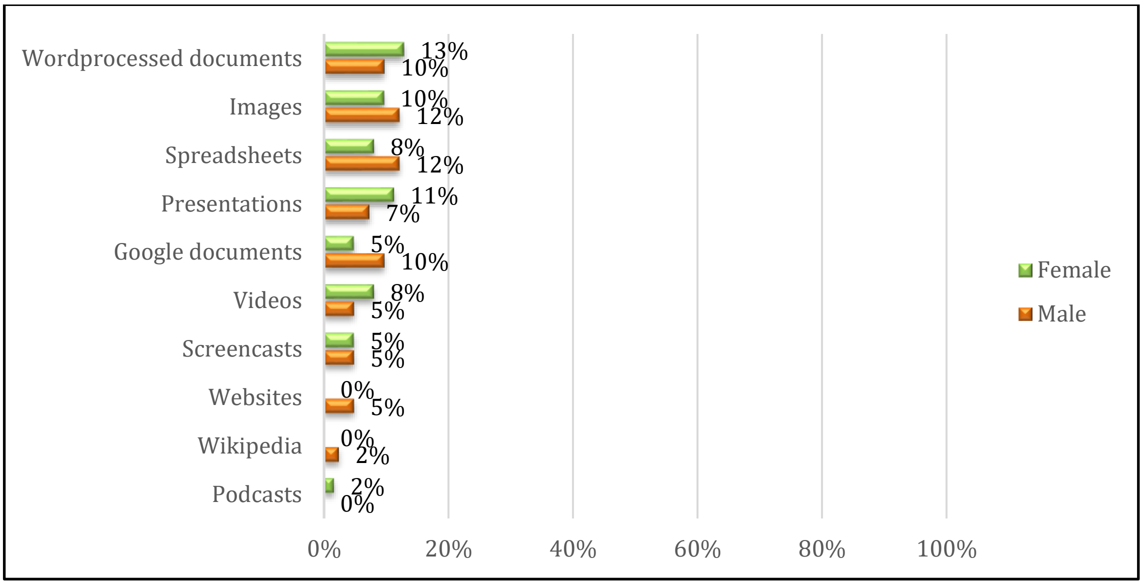


Figure 5.86: Gender and collaborative development of resources

No correlation was found between student gender and collaboratively developing resources.

With respect to enrolment in a computing-related subject whilst at high school, higher percentages of those students who enrolled in a computing-related subject than those students who did not do so, collaboratively created word-processed documents (45%), presentations (35%), spreadsheets (35%) and Google documents (30%) (Figure 5.87).

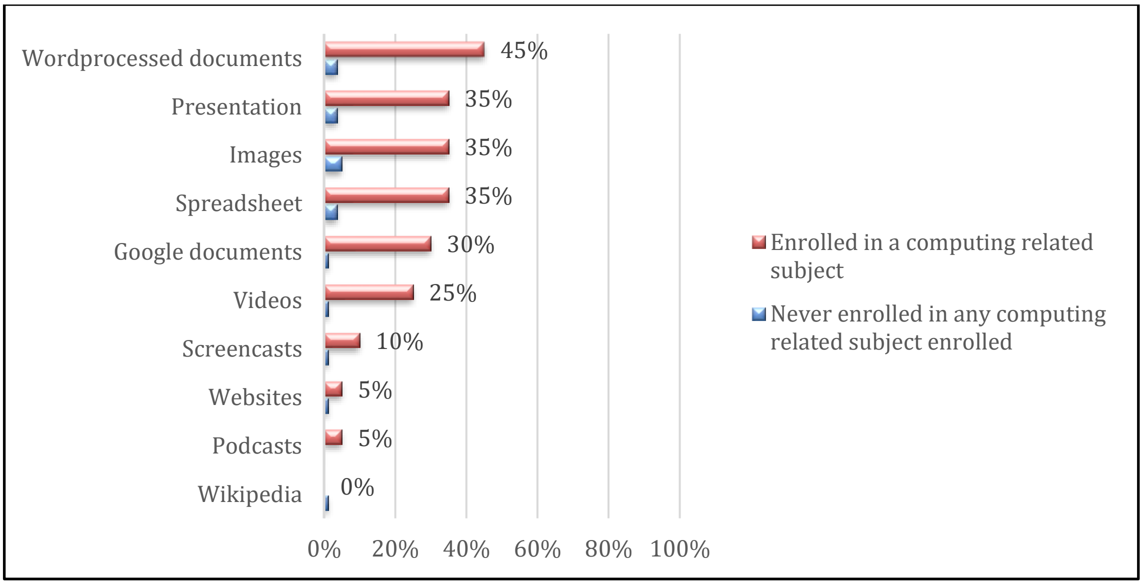


Figure 5.87: Age and collaborative development of resources

A Chi Square test confirmed a significant correlation ($p<0.05$) between enrolling in a computing-related subject and collaboratively creating word-processed documents, presentations, spreadsheets, Google documents, images and videos. That is, enrolment in a computing-related subject has influence on the collaborative development of resources.

5.4.6.2 Managing a professional online profile

On a Likert scale, students had to rate how frequently they thought about their personal reputation when they posted something online; ensured suitability of their posting for intended networks; and acted against cyber-bullying and reputation-damaging online behaviours (Appendix A, Question 21). The data demonstrates that the two strategies that the respondents most always applied were thinking about their reputations (67%) and ensuring suitability of postings for intended networks (59%) (Figure 5.88).

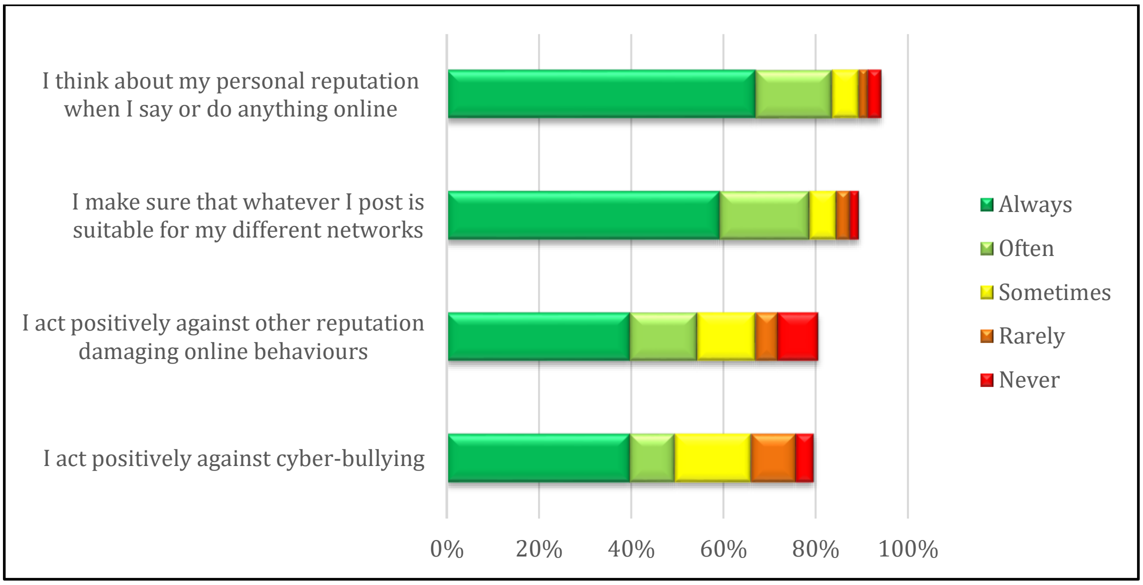


Figure 5.88: Managing a professional online profile

The least frequently applied strategy (40%) was acting positively against cyberbullying. It is important to note that two students indicated that all of these strategies were not applicable to them. These were part of the ten who did not engage in any social networking.

With respect to age, the most frequent practice for both age ranges is thinking about their reputation when they interact online (Table 5.10).

Table 5.10: Age and management of a professional online profile

	≤18 years					**19-22 years**				
	Always	Often	Sometimes	Rarely	Never	Always	Often	Sometimes	Rarely	Never
I think about my personal reputation when I say or do anything online	73%	23%	0%	4%	0%	65%	14%	8%	1%	4%
I make sure that whatever I post is suitable for my different networks	69%	19%	4%	4%	0%	57%	19%	5%	3%	3%
I act positively against cyberbullying	46%	8%	15%	8%	4%	38%	11%	18%	9%	4%
I act positively against other reputation damaging online behaviours	46%	23%	15%	0%	8%	38%	11%	12%	7%	9%

Table 5.10 illustrates that a higher percentage of those 18 years or younger managed their online profile better than the older age-group.

Regarding gender, there is no noticeable difference in terms of student practices. The above description suggests that managing an online profile is about a personal aspect rather than a pedagogical one and that age could be a contributing factor.

In summary, the above discussion demonstrates that student digital literacy practices for learning at university, more so those practices in the technical, cognitive and techno-cognitive dimension, are influenced by factors such as the disciplines of the courses, learning and assessment activities, student enrolment in computing-related subjects while in high school, gender and age. The next section provides examples of discipline-specific learning and assessment activities and highlights the socio-cultural factors influencing the students' digital literacy practices. The section uses Cultural Historical Activity Theory (CHAT) as an analytical tool for visualising the collective activity and individual actions of students in their respective learning systems in the two courses being studied. Drawing on this strength of CHAT, the data reflects that, within the collective activity, students (Subject) performed various goal-oriented actions. CHAT also helped in teasing out the structure of each course's learning and assessment activities (LAAs).

5.5 Discipline-specific digital literacy events and socio-cultural factors that influence the student digital literacy practices

This research uses Engeström's (2001) second-generation activity theory as "an analytical tool for understanding [the] complex learning situations that cannot be observed in natural settings" (Yamagata-Lynch, 2010:23). The discipline-specific LAAs in this research are production of an e-business concept document in the Commerce course and an essay construction in the Humanities course. By their nature, these LAAs require particular academic and digital literacies, such as the cognitive ethos, including researching, analysing and synthesising information, developing arguments, paraphrasing and writing conventions. In both courses students were required to upload their assignments onto the LMS, Vula. Commerce students had to download their Google document as a Word document and upload that onto Vula. Humanities participants had to upload Word documents of their essays onto Vula and submit a hard copy too.

5.5.1 The digital literacy event as a unit of analysis for the Commerce course

The activity in the Commerce course is the collaborative production of an e-business concept document. That is, students collaborated on a shared task. The digital content-creation literacies involve practices in the cognitive domain, such as collaboratively developing the business concept document and developing a site map for an online store website, technical capabilities of creating and sharing a Google document and social-emotional ethos of working with peers on a collaborative task. Below is a description of the student learning system together with the digital literacy practices involved in the LAA.

Elements of the Commerce learning system

Subject

In this activity system, groups of students are the subject because students in this course were assigned a group activity.

Community

The *community* is comprised of students, the lecturer and tutors, with a tutor assigned to each group of students. Students were required to use a Google document to collaboratively create an e-business concept document (in response to short-answer type questions that included brainstorming about content for an e-store).

Object

The object of this activity system is the production of a concept document for an e-business and the lecturer's motive was to develop student understanding of e-business operations and digital content-creation skills. For instance, a participant reiterated that they worked towards a common understanding of how they were going to represent their store online:

> We just copied and pasted pictures that we found to make it look similar to an Amazon website . . . we were not creating a website yet so we just thought: "Let's create a format of what it should look like, more or less" [Course A, G1, line 67-69].

Another participant who had reported that her group was not fluent in using Google documents, said that they had met as a group, typed in Word, and then she shared their Word document by e-mail so members could contribute, and also uploaded the content onto a Google document:

> I e-mailed it to everyone and then everyone could edit, add their input or change where they wanted to change it and add thing also . . . like Student A added a . . . a diagram to the document . . . I typed out most the work, he just added the diagram. One question was about a … business process but then the financial flow is mentioned, I typed it out whereas he made it in the form of a flow diagram . . . so he added that to the document [Course A, Interview, line 54-58].

The above excerpts demonstrate how individual subject goal-directed actions may lead to a collective activity, although the last excerpt also demonstrates how the group deviated from the objective of collaboratively producing a concept document due to lack of technical skills of creating and sharing Google documents.

Furthermore, the data also revealed that, for seven of the participants, Google documents use initially became the object of the activity system and so learning how to use the tool became the focus for these participants. For instance, in addition to those who Googled how to use the tool, two (2) participants expressed that they asked their tutors to create the Google document for them (n = 1), or teach them how to create one (n = 1).

Rules and norms

In the Commerce course, the lecturer set up the LAA instructions (*course rules*) where students were required to form groups (self-select a group on Vula) of a maximum of six members. Each group had to discuss and respond to the short questions, and draw a site map[25] of the business they were conceptualising, in a Google document. Student answers were to be guided by the mark allocated to each question. Each student then submitted a Word version of this document on Vula. That is, groups had to brainstorm ideas in Google documents, collaborate and share ideas; answer the questions using their own words; and include a bibliography of information and image sources. Furthermore, instructions stated that students could use any OER to help them complete the task. Also, students could refer to the amazon.com website to explore examples related to the online stores they were planning. Each group was expected to share its collaborative writing document with a group tutor who monitored activities and provided formative feedback to the group. There was also an indication that marks, ranging from one to five (1-5), were to be awarded for participation in the collaborative document.

[25] A site map or sitemap is a graphical presentation of pages of a web site.

Below is a description of the digital tools (as drawn from the qualitative data) and digital literacy practices involved in the production of the concept document.

5.5.1.1 Technical dimension of digital literacy practices

In this course, students used technical tools and artefacts, such as technological devices, Google, lecture slides, Wikipedia and business-related websites to source information and images.

With respect to technical practices, the qualitative data reveals that nine student groups created and shared Google documents as they completed their assignment, whereas two students reported that they used both Word and Google documents. A participant reported that her group members formed a WhatsApp group and communicated about the meeting time via WhatsApp.

However, it is important to note that, regarding the technical tools, one participant highlighted that most of his group members had neither laptops nor smartphones, hence they still had to go to the computer laboratory to contribute to the collaborative working document. This, therefore, means that these students' limited access to (or not owning) a computer constrained the collaborative process. This implies that student limited access to technology beyond the university computer laboratory may constrain this type of learning activity and, effectively, any other technology-based learning activity.

5.5.1.2 Cognitive dimension of digital literacy practices

The participants' responses indicate that they engaged in digital literacy practices in the cognitive dimension, such as identifying what information was needed to complete the assignment, evaluating online information, site mapping, understanding academic integrity (including attribution of sources and in-text citation) and drawing up a bibliography list, and synthesising and communicating information in the form of the concept document (See Section 5.4.2 for the cognitive dimension of digital literacy discussion).

With respect to identifying need for information, when Commerce participants were asked to describe how they went about collaborating with peers on the shared task, only two of them explicitly described how they went about conceptualising what the task required so they could subsequently identify the information they would need. Two students said that they first interpreted the questions, and one of them also reported that, in her group, they went to the extent of drawing a mind map.

Students were required to conceptualise and draw a sitemap for their envisaged online store. A critical outcome of the site-mapping exercise was the development of a sitemap for the online store website. Students also synthesised their responses to the LAA questions in the shared Google document. Surprisingly, the nine assignments (two pairs of the 11 participants were in the same group) produced by students reflect that only one out of nine groups drew up a bibliography.

5.5.1.3 Techno-cognitive dimension of digital literacy practices

Students also engaged in techno-cognitive practices, such as searching for information and selecting appropriate software for site-mapping.

As indicated in the discussion about online resources above, students primarily used online resources such as Google and Wikipedia to help them to complete the task. For instance, four participants explicitly indicated that they used Google and one of them also used Wikipedia to supplement the lecture slides. Two participants used Google to look up definitions, five to learn about course concepts related to the task, one to find relevant images and three to learn about information they applied in the group-work. However, the student who used Wikipedia, was unaware that he was using as OER. Furthermore, students also searched for images and examples of products sold on online business websites such as OLX (1) and Amazon (3). One student described what they used Amazon for:

> We also went to Amazon to see what type of . . . because that was the suggestion in the instructions, to go to Amazon to see what type of . . . businesses are on Amazon so you could decide from there what you want your business to sell so we saw the gadgets on Amazon and then decided that we were going to sell that [Commerce, Interview, line 153-157].

One group used an alienware[26] website to source images of the products they agreed to sell as a group:

[26] http://www.dell.com/en-us/gaming/alienware?cs=19

> In our group, we decided to sell computer games; it’s alienware so we went to the alienware site and would take screenshots of them with a phone and share them on WhatsApp. In Amazon too, we would look up their products such as cellphones, take pictures and share with the group and say: “Guys, how about this type of cellphone?” Once we had agreed on the products, we assigned one group member to go onto the internet and download the pictures of the products and upload them into the Google drive [Commerce, G3, line 200-204].

However, although this was good collaborative effort, the images were not attributed (cognitive practice); the group document had the pictures together with their descriptions ‘as is’ from the website. The two above excerpts demonstrate that these groups neither attributed their images nor acknowledged the sources of the content, as per the requirements of the learning activity. Moreover, the student Word documents illustrated that none of the groups used openly-licensed images. Although there is a presentation on OER use on the Course site and a recommendation that students use OER for their task, the data revealed that students were still unaware what OER are (also see Section 5.4.2.1).

Additionally, students were required to make choices of appropriate software to use for undertaking the drawing of a sitemap. For instance, a focus group participant mentioned that she used the SmartArt feature in Word, while other participants said that their group members used software they did not know about. In fact, from the assignments (artefacts), I found that seven student groups (two participants were from the same group) used the SmartArt feature for this. This implies that on one hand, the students who used SmartArt made an appropriate choice of a readily available tool. On the other hand, those individual students who knew about drawing the sitemap undertook the drawing activities without involving the other students. Unfortunately, this contradicts the object of the activity.

Furthermore, one group had a screenshot of an e-store website, with tabs instead of a sitemap. This demonstrates that the latter group misunderstood the activity requirements because, even if they got the idea from a specific business website, they had to draw their own business sitemap based on that idea. The fact that this group reused other website content ‘as is’ was affirmed by the group’s member who said:

> We just copied and pasted pictures that we found to make it look similar to an Amazon website . . . we were not creating a website yet so we just thought: "Let's create a format of what it should look like, more or less" [Commerce G1, line 67-69].

In addition, the fact that the source of the screenshot was not attributed (cognitive skill) in the Word document, indicates that the group of students did not understand or deliberately excluded attribution of images.

5.5.1.4 Technical and social-emotional dimension of digital literacy practices

Three students in the focus groups reported that they discussed activities and shared screenshots, links and screenshots with ideas about what the online business would entail. For instance, one group shared links and also downloaded images of products and website features (such as tabs), that they suggested group members should add to their online store website, via WhatsApp. Two students reported that their groups shared screenshots that they captured using their phones, in the Google document.

5.5.1.5 Cognitive and socio-emotional practices

When participants were asked to describe how their groups worked on their learning activity (collaborative production of the e-business concept document), nine participants who had solely used Google documents indicated that they contributed (by posting content and adding to what their group members had posted in response to particular questions), edited and commented on the Google document. The student assigned by the group to work on a specific question would visit the links and image sources, and then choose what he or she could contribute to the group's Google document.

In addition to the above, the other two participants reported that they used Word and Google documents concurrently. One of them reported that her group met face-to-face to construct the Word document and used WhatsApp in between the meetings, to discuss content matters, such as how they were going to respond to their questions. The other participant reported that her group met face-to-face to construct the Word document while everyone was making input and giving opinions. In their Google document, they initially wrote 'chats' until their tutor told them to upload the content onto the Google document:

> We firstly met and discussed, and then began writing little chats on the Google document while we were typing content on a Word document, and then she [the tutor] told us to upload the content into a Google document. I didn't know that you could comment and someone could reply to your comment [Commerce, G3, line 94-96].

The above excerpt demonstrates that this group only uploaded the content into a Google document to share with the tutor, because the participant acknowledged that the group members downloaded the same document, to submit on Vula. When asked whether there wasn't any confusion when working between documents, she said:

> I think there was a lot of confusion with our Google document because we didn't know about the editing, etcetera. … Our tutor, . . . she never helped us, we just showed her our content [Commerce, G3, line 91-92].

This excerpt also demonstrates this group's expectations about the role of the tutor in this learning activity. This highlights students' lack of digital fluency with affordances of Google documents and the lack of clarity on the role of the tutor.

The above discussion demonstrates that a collaborative document-creation activity involves a range of intertwined practices such as technical operation of tools such as Google, making choices about the appropriate software for developing a sitemap, researching, synthesising information, contributing and communicating information, attributing resources and referencing. In addition to that, those students who collaborated in Google documents converted the document to a Word document, and uploaded it onto Vula.

Division of labour

In this course, the lecturer set up the learning activity, provided or recommended resources and provided support; tutors provided formative feedback to students; and students assigned roles amongst themselves as they worked on the collaboration activity. Participants' responses indicate that their digital literacy practices were primarily mediated by division of labour. For instance, a participant whose group met physically explained that members would only access resources when they were together; they would search for information from the internet and prescribed textbook while the delegated scribe typed in a Word document. Also, as indicated earlier, those who used the Google document contributed, edited and commented on one another's input, with most groups assigning a question to each member, and one group having group members answering all questions, voting for the best response and then contributing to that one. Other roles negotiated in groups included finding of information and images, and downloading and sharing images for the online store website.

Furthermore, the data reveals that a phenomenon that competed with division of labour was volitional acts. Some members were driven by their individual ‘volition’ to take up some roles. For instance, a participant reported:

> . . . one of the guys in our group is very into that kind of stuff . . . because he created the sitemap for our e-business project . . . because he likes that kind of stuff so he just said: “I’ll design it” [Commerce, G2, line 121-122].

Another student felt he had time to create the Google document and so he volunteered:

> … Because I had time . . . I had done it before. I just thought it’s not going to be a lot of trouble, . . . let me just do it [Commerce, G1, line 10-11].

However, the data also reveals that participants’ roles in the activity system had the potential of limiting what they learned. For instance, on one hand, the two excerpts below reflect that students who were not involved in the development of the sitemap, did not engage in the conceptualisation of the online store website:

> Researcher: He used a type of software for that?
> Participant: The sitemap?
> Researcher: Yes
> Participant: I’m not quite sure what he used
> Researcher: Ok, . . . then he put it into the Google doc?
> Participant: Yes, he pasted it onto the Google document, . . . so as we each did our different tasks, we put them onto the Google document and then commented as we needed to, such as: “It’s fine here”, “Change here” . . . [Commerce, G2, 121-129].

> One of my group members used a drawing system, ... I don’t know what it was, and then he just copied and pasted it into the Google document [Commerce, G1, line 41-43].

On the other hand, some students learnt through practice. For instance, a participant reported that, because her group had been handing pieces of paper to the assigned group scribe who would type up the work, she later decided to create the Google document for her group:

> I had never used Google docs before so I just Googled Google docs and then signed up via Gmail and everything, and then I created it. I downloaded the App on my phone so I could access the document as I was working [Commerce G1, line 12-14].

More detail about learning is in Section 5.7.

The data also reflects some traits of power and status playing out in the learning system. For instance, three participants reported that their groups called on their tutors when they needed technical support such as creating a Google document. One of the groups had used Word Online but asked the tutor's guidance on how to transfer their content to Google documents.

Outcome

The outcome focuses on the result after working on the object. For this activity system, the outcome was a concept document for an e-business. The lecturer's desired outcome was that, in the process of collaborative production of the document (that both facilitates and becomes an artefact of the group work), students would acquire knowledge of e-business systems and digital literacy skills. Section 5.7 describes what students learnt as a result of engaging in the learning activity.

The Commerce learning activity system is illustrated in Figure 5.89, below.

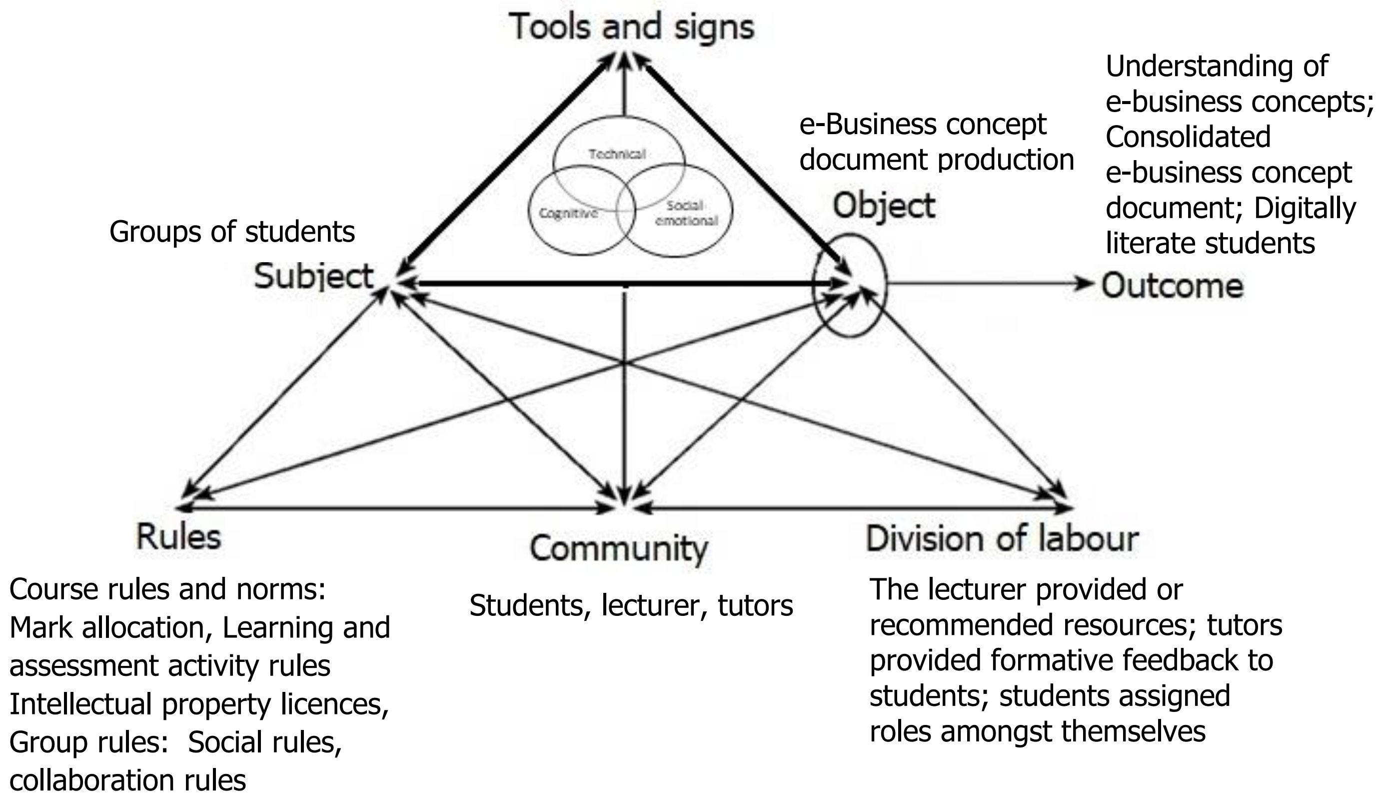


Figure 5.89: Commerce course learning activity system

The following section describes contradictions emanating from the socio-cultural practices as highlighted by the qualitative data.

Contradictions

Contradictions revealed by the Commerce student responses are described below.

Secondary contradictions: Subject-division of labour

Three participants highlighted that ‘time’ influenced how they assigned roles and responsibilities. For instance, on one hand, a participant said that because her group consisted of friends, it was easy for them to find time to meet and work together on the project. On the other hand, another participant said that her group consisted of students who were also enrolled for Economics, in addition to the respective course. Those who were not enrolled for Economics, therefore, had more time available to discuss the task. These students then updated the rest of the group. On the contrary, as mentioned before, a participant who was also enrolled in Economics said that he had time to create and share the Google document.

Interestingly, this student had used Google documents before, whereas the other two participants indicated that no one in their groups had used Google documents before so they still had to learn how to use it. This meant that it took these two groups additional time to start using a Google document for their task. This implies that students’ technology experience, such as collaborating in Google documents, either enabled or constrained students’ learning activities and, thus, how students allocated roles within their groups.

Secondary contradictions: Subject-tool

Seven participants reported how their lack of technical capabilities (in terms of Google documents) impinged upon their goal-directed actions. That is, these students lacked prior experience in creating and sharing Google documents (the subject producing activity system represents the characteristics of the students that they bring with them from high school). As indicated earlier, these students had to learn how to use Google documents. This implies that even though these students had access to technology, their technical skills of using Google documents constrained how they went about working on the task. Section 5.6 provides details of what technical skills students learnt and how they learnt them.

Figure 5.90 illustrates the secondary contradiction and the dynamic nature of the object of the activity.

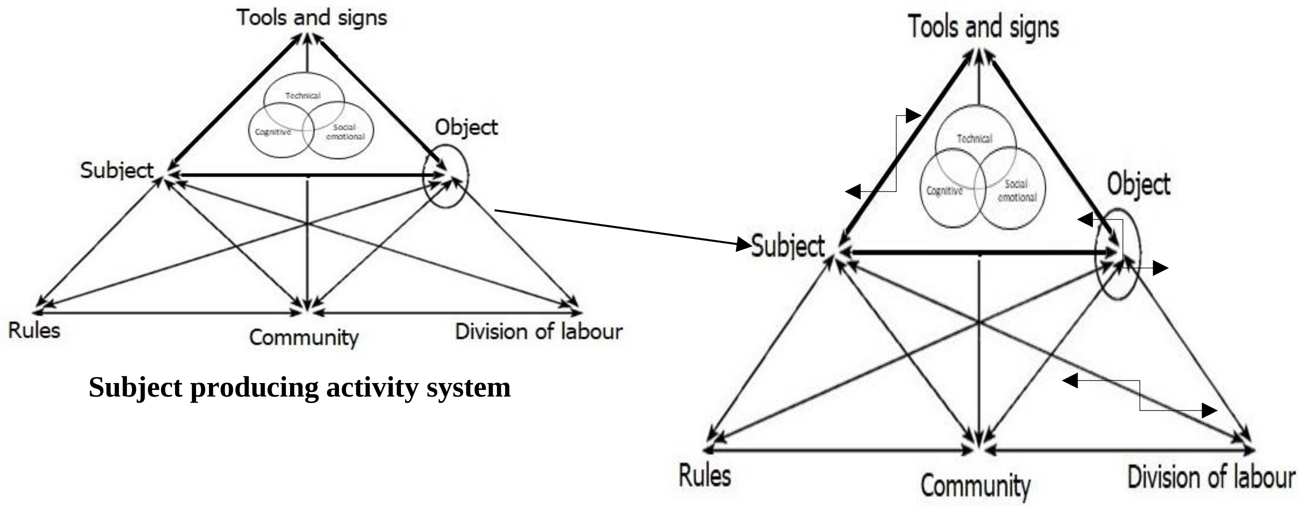


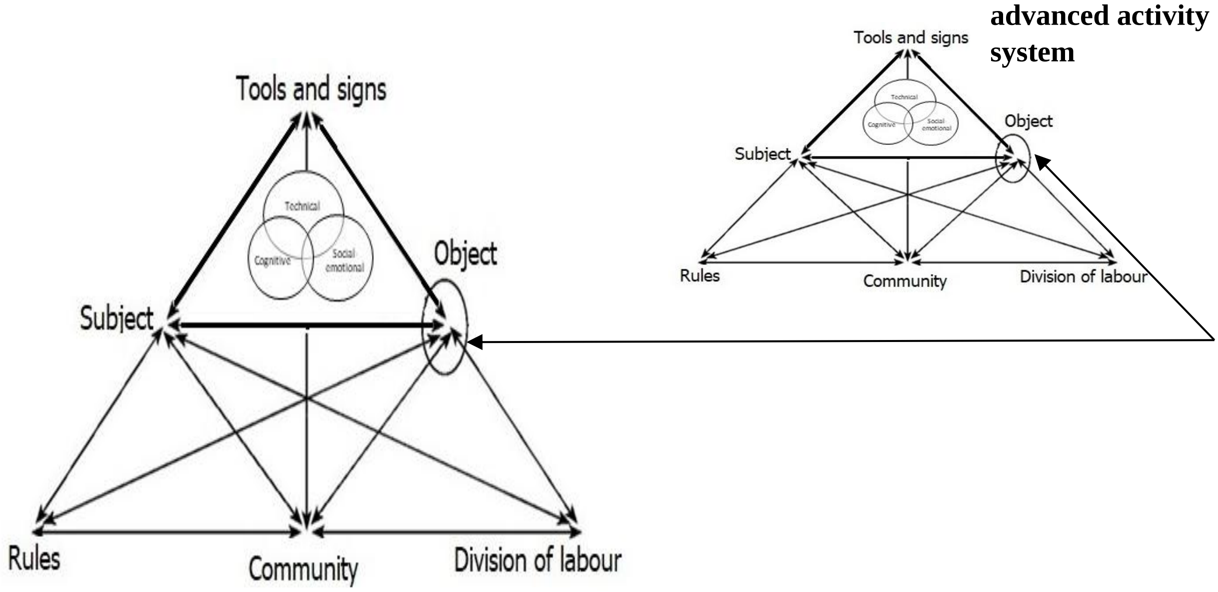
Figure 5.90: Secondary contradictions in the Commerce course learning activity system

Tertiary contradiction between the existing and a more advanced activity system

Two participants indicated that they were familiar with face-to-face group-work from high school. Also, both the quantitative and qualitative data revealed that students were used to engaging in WhatsApp groups for personal purposes. This may explain why these students' groups reverted to the means with which they were familiar, such as using WhatsApp, meeting face-to-face and typing their work in Word. As discussed above, these two groups retrospectively uploaded the content into Google documents, but did not collaborate on content creation there. This implies that their inexperience in using Google documents constrained their collaboration practices. However, four participants reported that their groups acquired skills on how to create Google documents and, subsequently, collaboratively created content there.

The tension between the old system and a more culturally advanced system that was demonstrated here by the student groups who either reverted to the practices they were familiar with or acquired technical skills required by the learning activity, is illustrated in the Figure 5.91, below.

Culturally more advanced activity system



Commerce course learning activity system

Figure 5.91: Tertiary contradictions in the Commerce learning activity system

The next section describes the Humanities LAA, digital literacy event and the associated student digital literacy practices.

5.5.2 The digital literacy event as a unit of analysis for the Humanities course

The activity in this course was the construction of an essay. By implication, through essay construction, students were primarily creating and remixing content from information sources (cognitive dimension) such as the course reader articles and online resources. That is, students engaged in academic essay-writing activities that required the integration of literacies in the cognitive dimension, such as development of argument; awareness of academic intergrity to avoid plagiarism; paraphrasing; and in-text citation and referencing; and technical capabilities of operating the word-processing software, Microsoft Word. Below is a description of the student learning system together with the digital literacy practices involved in the LAAs.

Elements of the Humanities learning system

Subject

Student essay writing (learning system) was the unit of analysis in this course. Individual students are the *subject* in this course activity system.

Community

The *community* is comprised of students and lecturers. The data reflects that in addition to the student and lecturer community, students built their own extended communities. For instance, a participant shared that she consulted a senior student who had passed the respective course two years ago:

> I use a different route … I send mine for marking; it is marked by someone else. … Now, I write my essay, then go to Gmail . . . then I send it to a more matured student, who's doing 4th year, here at UCT . . . and then he would pick it up and help me [Humanities, Interview, line 67-75].

Another participant said that her sister who was enrolled for her second year at the university taught her how to use an application that improved her writing practice:

> . . . My sister taught me Grammarly. There is an App called Grammarly where you submit your essay and then they pick up plagiarism, synonyms, the words that you commonly confuse, . . . I usually use that App. Before you put your assignment on Turnitin, it has already told you that you plagiarised this. It picks up if you have spelt incorrectly, things like that . . . [Humanities, Interview, line 94-96].

These excerpts demonstrate that students extended their learning communities beyond that of lecturers and themselves.

Object

The general object for the activity in this course was constructing an essay on race, gender and identity, as outlined by the lecturers. In terms of the goal-directed actions, the data reflected that some students engaged in actions of comprehending what the essay required of them and identifying what information was needed for the essay. Students also searched for relevant information, produced drafts (one participant reported that she e-mailed hers to the lecturer, for comments) and, later, final versions of essays.

Rules and Norms

To facilitate the relationship between students and lecturers involved in the essay-writing process, lecturers set learning-activity requirements (*course rules*). Students engaged in individual tasks where they had to write ±1 000-word-long essays. For each essay, students had to: (1) reflect an understanding of the key concepts they were writing about; (2) construct an argument; (3) draw on the prescribed readings (could also use other readings); (4) use Harvard referencing style; (5) draw up a reference list; and (6) attach a signed plagiarism declaration form to the cover page. For each essay, a submission link to where students could upload their drafts was created in Vula by the lecturers.

5.5.2.1 Technical dimension of digital literacy practices

In this course, students commonly used technical tools such as technological devices, word-processing software, the internet, and e-mail (one stated that she e-mailed her essay drafts to her lecturer) to complete their assignments. All students uploaded their final versions onto Vula. One participant reported that she relied solely on the university computers and, when in the residence, she used the computer labs there. Also, another student from this course reported that she lived off-campus and could not afford buying data bundles on a constant basis. This implies that the first student could only work on her tasks during lab hours. The second one indicated that she had to download most of the reading material onto her laptop while she was on campus. This highlights that limited access to computers and/or, internet may have constrained how these students worked on their essays and, consequently, any other technology-based learning activity.

5.5.2.2 Cognitive dimension of digital literacy practices

The assignment writing activity also required students to engage in digital literacy practices in the cognitive dimension, such as identifying what information was needed to complete the assignments, evaluating online information, understanding academic integrity (including attribution of sources and in-text citation), drawing up a reference list, and synthesising and communicating information (such as developing an argument, paraphrasing and summarising) in the form of an essay. (Also, see Section 5.4.2 for the cognitive dimension of digital literacy discussion).

With respect to identifying a need for information, when Humanities participants were asked to describe how they went about writing their essays, only two of them explicitly described how they went about conceptualising what the task required so they could subsequently identify the information they would need. For instance, one student reported that interpreting the essay question and information needed took more time than writing the essay:

> . . . if I get the essay question today and I have time, maybe I would start . . . first read quick, quick and skim through and then later . . . I would read through it again to understand what the essay question is asking of me, and then I would make notes along the question . . . about what the question is and what is expected of me, and then I would go and start reading whatever I am expected to read. … and then I read the question again and then go back to the reading and start choosing which parts I want to use for the essay [Humanities, Interview, line 10-17].

Another student reported that she knew that each of the three main topics covered in class would have an essay linked to it. She jotted down notes and made summaries in class so, when they were given an essay question, she would interpret it and then structure her argument accordingly. This student though, only used resources from the course reader.

Regarding academic integrity, it is assumed that all students in this course were aware what plagiarism means, because all students were required to attach a plagiarism declaration form to each of their essays. In the focus groups and interview, seven participants reported that they paraphrased to reduce plagiarism, two used plagiarism-detection software such as

TurnItIn[27] and one of them also used Grammarly[https://www.grammarly.com/]. What was interesting was that these two students used these tools for formative writing, for instance, excerpts from the student who used Grammarly illustrate this. Also, a student who used TurnItIn said:

> . . . so I uploaded my document then I checked for plagiarism and it showed me how I was supposed to construct my sentences, and then I did that. So, it helped me to reduce plagiarism [Humanities, G1, line 225-227].

With respect to referencing, seven participants indicated that they always referenced their sources and two said they were aware that they were supposed to use the Harvard referencing style. One of the two students said that she used Google Scholar to look up referencing styles:

> I use Google scholar more especially for referencing because there is that cite feature that shows you the different types of referencing . . . I select the Harvard one and then jot down the full reference and add to my essay [Humanities, G2, line 21-23].

These students' knowledge of referencing was demonstrated in their essays too. This student used APA in the first essay and then Harvard in the second and third essays, while the other student used Harvard in three of hers. Another participant used a reference-generating tool named 'Cite this for me[http://www.citethisforme.com/citation-generator/harvard].

> . . . I use 'Cite for me' when I am preparing my bibliography . . . because it gives you everything – the year, . . . it also writes the name of the journal in italics because you have indicated that your source is a journal . . . I have always used it and I do well in my essays [Humanities, G3, line 121-124].

However, although there was awareness about referencing, two participants were still concerned that they could not reference. This then constrained students' agency to search and use resources beyond those provided in the course reader. This is illustrated by the excerpts below:

> Referencing the readings is easy because they [lecturers] give the readings and how to reference them but the minute you make use of Google or Wikipedia, it becomes difficult because it is not always written for you there [Course B, Interview, line 129-131].

Also,

> Participant: I heard about Google Scholar . . . there are articles and they have references . . . In very rare occasions, I read articles on Google scholar . . . they are relevant.
> Researcher: Then you would cite and reference content from there?
> Participant: I don't take any content from there . . . I rather play safe . . . I don't want to be accused of plagiarising [Humanities, G3, line 267-270].

[27] https://www.turnitin.com/

These two excerpts demonstrate that these two students were neither able to reference resources nor were aware of any reference-generating tools they could use for referencing.

Data from the focus groups, interviews, and student artefacts reflect that participants generated the list of references after completing the written text. For instance, the participant who reported that he used synonyms to replace original words to circumvent plagiarism said he did that when he could no longer remember from which book he sourced the text. Another participant said that she manually sorted the references:

> I type a day or two before the submission date, . . . I type everything because I have it on paper, and the reference list, I would work out on a piece of paper . . . because it needs to be alphabetised . . . I mark my references; 1, 2, 3, 4, like that, and then start typing it out [Humanities, Interview, line 234-236].

The manual addition of reference lists seemed to be the case with all 16 participants because their essays reflected that they did not use any reference management system. Related to this, two participants said that they used a reference-generating tool, the Google Scholar 'cite' feature and the 'Cite this for me'website. It is evident from the above that students used resources (with provided references) from the course reader and students might have just copied the references from there, after writing the text.

Furthermore, participants' responses also demonstrated that some understood that essay writing was a process that involved both comprehensive reading and structured writing. For instance, a participant described how she went about framing an argument for an essay:

> . . . So what I do when I am about to write an essay, I'll summarise the reading and then write them in my own words and then try to construct my introduction like, how I am going to . . . put down ideas or how I'm going to approach my essay or my argument. I jot down my introduction. If I feel that it's not good enough, I'll send it to my lecturer and hear what she thinks and then she comments here and there [Humanities, G3, line 49-53].

In addition to the above, seven of the participants reported that they paraphrased, although it was evident in their responses that, for three of them, paraphrasing was more about replacing some words with synonyms than summarising key ideas. For instance, two participants said that they used Google to look up synonyms to replace words in sentences.

Below is an excerpt that illustrates two participants' understanding about paraphrasing where Participant 1 perceived that paraphrasing is about using synonyms:

> Participant 1: I also do that . . . for instance, when paraphrase, you have to write what an author said, in your own words so I look for synonyms on Google, . . . I use Google every day basically . . . to check for synonyms, nouns, adverbs, adjectives, things like that.
> Researcher: With paraphrasing, do you mean that you just replace words with their synonyms?
> Participant1: That's how I understand it and that's how I do it.
> Researcher: While keeping the same structure? Writing the same sentence but replacing words with their synonyms?
> Participant 1: Sort of . . . something like that.
> Participant 2: I don't do it like that; I keep the idea but change the sentence a lot.
> Participant 1: We still have to reference it so it's just a matter of changing some words. You still have to reference even if you paraphrase. So, I keep the sentence the same but change some words [Humanities, Group 3, line 188-198].

5.5.2.3 Techno-cognitive dimension of digital literacy practices

All participants reported that they sought information in the course reader, and online resources such as Wikipedia, JSTOR, EBSCOhost, Google Scholar, internet (Google) and Dictionary.com (see section 5.4.2). In addition to this, the participants' essay reference lists reflect that two participants used YouTube videos, two used Wikipedia, three used eight other online resources, one used a blog, and one used Sabinet Legal[28] (to access a labour relations act).

Students' responses reflected that there were some lecturer expectations (or norms) that influenced how they went about finding information resources for their essays. For instance, two participants said that their lecturers recommended the use of JSTOR. Furthermore, a participant mentioned that their lecturers always advised them to use definitions from the readings provided in the course reader. She said:

> . . . they [lecturers] give you some readings and then you can use the internet if you have definitions that you want to use but they always advise you to take the definitions from the reading itself. It's just if you want a broader understanding of it [definition] [Humanities, Interview, line 30-32].

This excerpt indicates that although the lecturers accommodate student agency, there are also implicit lecturer expectations that influence the choice of literature sources.

[28] http://discover.sabinet.co.za/

The above discussion of technical and conceptual tools demonstrates that there is a range of intertwined practices that mediate essay construction or writing. These include technical practices such as typing in and formatting a Word document; techno-cognitive practices, such as using web tools to search for information; and cognitive practices such as researching, synthesising information, and assimilating and communicating information – paraphrasing, developing an argument and referencing.

Division of labour

In this course, there was horizontal division of labour between the lecturers and students. The lecturers provided students with resources such as hardcopy material in the course reader, while digital resources included links to YouTube videos in Vula, a relevant blog, a News 24 article and two other online resources. Students could also look up the recommended readings, find and use additional resources too, as discussed in Section 5.4.3.2.

Furthermore, the data reflects that students sometimes consulted their lecturers for support. For instance, because of the lecturers' approachable manner, students felt they could always turn to them for support. A participant shared:

> . . . if there is this very, very big word that I don't understand in the reading, I would Google it and try to understand the meaning from Google. …. but sometimes Google is not all that clear . . . so if that fails then I would ask the lecturer what it's about [Course B, Interview, line 39-44].

Another one said:

> I e-mail it to my lecturer and she would comment. I see her opinions . . . whether I am on the right track . . . and then I continue writing my essay. That's how I do it . . . I did that with the first one because we were new and didn't know anything but with the second and third one, I didn't; I sent the whole draft and she would write down her comments, opinions, and all that stuff but for the first one, it was only the introduction . . . and she commented . . . and I actually did well [Humanities, G3, line 55-59].

Outcome

The desired outcome of the lecturers was that students acquire knowledge and develop an understanding of course content. Also, it was expected that students would acquire academic writing practices and digital literacies for essay construction. Section 5.6 describes what digital literacy skills and practices students acquired as a result of the learning activity.

The Humanities learning activity system is illustrated in Figure 5.92.

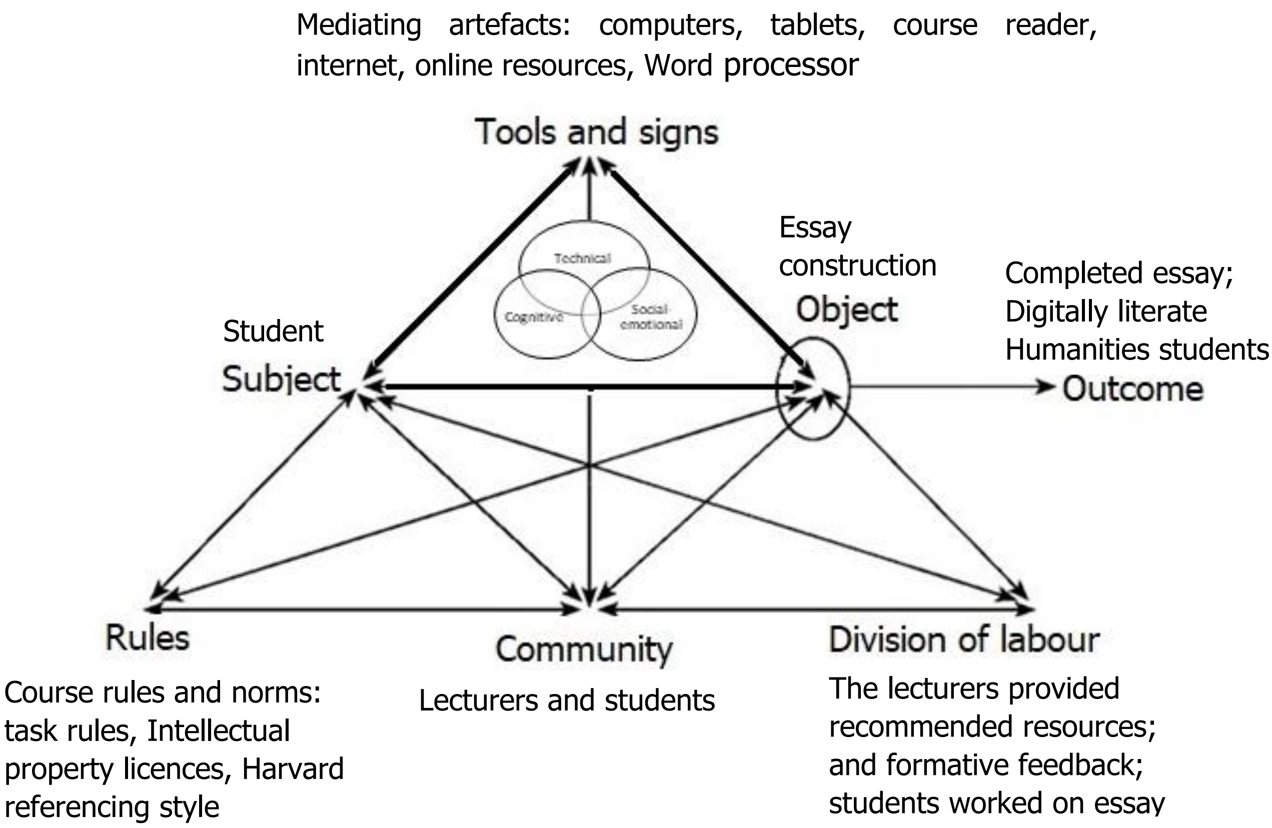


Figure 5.92: Humanities learning activity system

Contradictions

The data highlights some tensions between the subject, and rules and tools for mediating essay construction.

Secondary contradictions: Subject – Rule

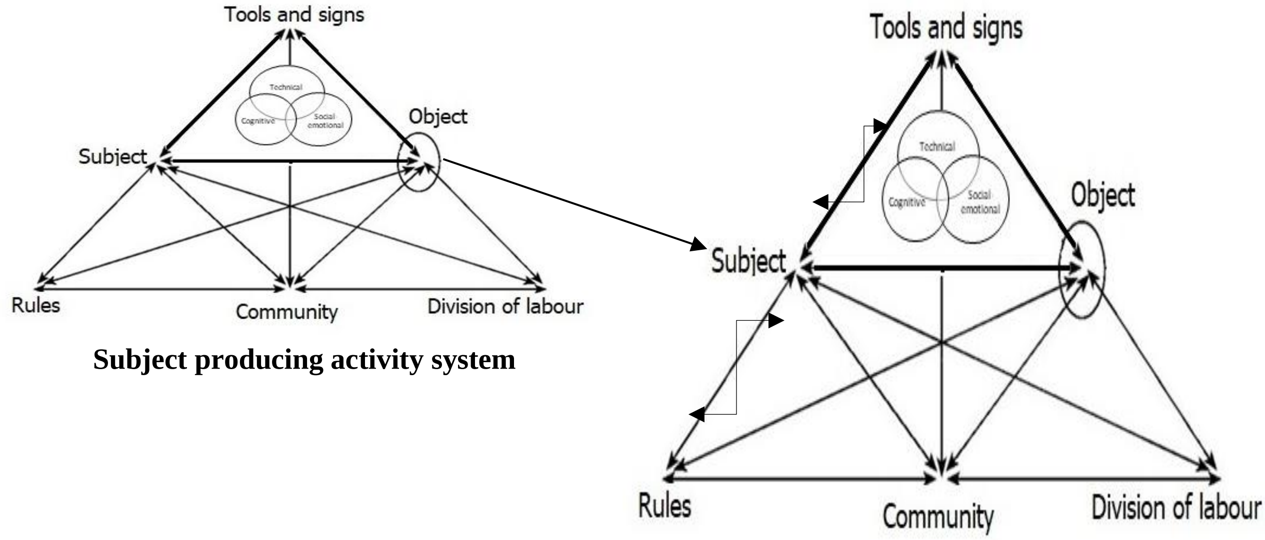
The data revealed that some students' agency of finding resources was constrained by the fact that they had to reference all their resources. For instance, one student admitted that it was easier for her to reference videos and other resources from Vula and the course reader respectively, because the references were provided by the lecturers, than referencing those resources she found herself. Another participant reported that she did not use resources from Google Scholar because she did not want to be accused of plagiarism. Also, another participant reported that their lecturers said they should not use Wikipedia because they could not determine who the original authors were. Interestingly, this student referenced two Wikipedia resources in one of her essays and they were incorrectly referenced (link is inaccessible). The above indicates that these students' use of additional resources was constrained by the essay writing rules. This implies that these students may need to be specifically taught how to reference online materials. This suggests that providing students with resources on referencing (such as the material in the course reader and Course site) is not sufficient for students to acquire appropriate referencing techniques.

Furthemore, the data revealed that four of the seven students who reported that they paraphrased, did not understand this cognitive practice. They simply replaced words from the readings with their synonyms. This student digital literacy practice suggests that the plagiarism declaration form that students sign and attach to their essay cover page may not be a true reflection of their work's academic integrity.

Secondary contradictions: Subject-tool

The two students who were unfamiliar with using digital technological tools such as e-mail, the LMS and word-processing software acquired these technical skills in the process of assignment writing. However, unlike the Commerce students, acquiring these skills did not become the focus of these students.

These tensions are illustrated in the Figure 5.93:



Subject producing activity system

Humanities course learning activity system

Figure 5.93: Secondary contradictions in the Humanities learning activity

The next section describes how students learnt digital literacy practices in their respective courses.

5.6 Ways in which students acquired discipline-specific digital literacies through content production in the two courses

The data revealed that students acquired digital literacies through different processes, such as self-teaching, scaffolding, practice, and trial and error. Interestingly, two students also developed awareness through observation of others' practices.

Learning through self-teaching

As discussed in Section 5.4.3, four students acquired technical skills on their own through searching on Google 'how to do something'. For instance, in addition to searching how to create Google documents, a Commerce student further reported that she Googled how to add a shape to a SmartArt graphic. She said:

> Participant: Hierarchy, yes, yes, yes. I didn't know how to use it; so, I had to go onto Google and then Google how to do it.
> Researcher: Hmm.
> Participant: And then I was able. I didn't know how to add the different elements because the one that they give you [Word SmartArt], . . . because they give you a standard one and then if you want to, you can add on, and then I didn't know how to find the place to add on and so I had to Google it and then I was able to add a shape [Commerce, Interview, line 87-93].

This excerpt is an indication that some students find it easy to search Google for whatever technical skills (how to operate something) they need to acquire, instead of consulting other people.

Learning through scaffolding from peers and senior students

The data also reveals that some students learned from their peers who had applied knowledge of the digital literacies required for learning, because they may have engaged in similar practices prior to attending university. For instance, a participant from Commerce shared how her group member learned to create a Google document:

> . . . I went onto the internet and just Googled how to use it, and then [Student A] asked his friend who is also in this course [Commerce] . . . and he told him how to create it [Commerce, Interview, line 34-35].

Another participant from Humanities said that she was not a technology fan but, when she enrolled at university, that changed, because her tasks required that she used technology, such as e-mail, internet and Vula, and so she approached her peers for help:

> Participant: Because I was anti-social network . . . everything; it was only WhatsApp and Facebook that I would do very little. …. Then when I came here, everything changed. I asked, "Am I the only one who doesn't know how to send an e-mail because everyone of you is using e-mail like it's nothing?"
> Researcher: Hmm…
> Participant: And so, I started going to tutorial sessions
> Researcher: With the Tech Buddies or Digital literacy tutors?
> Participant: Yes, and then my friends also started showing me what to do and how to do it. … I am excited because I can e-mail now [Humanities, Interview, line 199-220].

The above excerpt demonstrates that even those students who are assumed to be digital natives because of their age, may be unable to carry out digital literacy practices required for learning in their courses.

Furthermore, some participants consulted senior students or tutors about digital literacy practices. A participant from Commerce shared that a tutor guided his group through the process of creating a Google document:

> Participant: I can also add that I didn't know about Google documents at first but with the help of our tutor, we learnt about it . . . for me, it is similar to WhatsApp because we were communicating but the difference is that I could change someone else's message and vice versa . . ..
> Researcher: You mean that's what you learnt in the process?
> Participant: Yes.
> Researcher: What did your tutor do? Did the tutor create the document for you? Or did the tutor show you how to create Google documents?
> Participant: He showed us how to do it . . . because we asked him what a Google document was so, he said that one of us must go to Gmail and then he showed us the steps on how to create a Google document [Commerce, G3, line 26-34].

It is important to note that one participant also shared that the tutor created the Google document for them, using one of the group members' Gmail accounts. In this instance, students may have not acquired the skill but were excited to get their activity started.

Also, as part of scaffolding, a Humanities student reported that she was taught by a senior student (who is a lab assistant at her residence) how to open and respond to e-mail attachments, and formatting (such as inserting page numbers) in a Word document. These were some of the skills she required for, specifically, her essay writing, but also for learning, in general.

In addition to the above, while on one hand, a participant from Humanities was taught by her sister, who is a second-year student at the university, how to use Grammarly, a software equivalent to Turnitin (that also does proofreading and grammar checks), interestingly, another Humanities student identified a senior student, within the same programme in which she was enrolled, during the faculty induction sessions and asked him to mentor her. This student was excited about how she had improved her writing practice after she had been guided by the senior student on such:

> Participant: I didn't know how to reference . . . I put in dots and all that stuff, and so the senior student marking on the other side, highlights the thing and says: "Reference using Harvard".
> Researcher: Were you aware that you are supposed to use the Harvard referencing style?
> Participant: Yes, I chose it instead of the others, . . . like APA.
> Researcher: Ohh, you just didn't get the structure right?
> Participant: Yes . . . I thought you just 'gooi' [Afrikaans word meaning 'throw'] everything in there.
> Researcher: How did you know that you were supposed to reference using Harvard style?
> Participant: I was told in class . . . I wrote everything and then the references . . . which is very, very wrong which is why my first essay was so bad . . . When returned by the lecturer, it was looking like a mess. I thought that you write everything, full stop, done, conclusion and then list the references.
> Researcher: Ohh, you didn't use in-text citations?
> Participant: Yes, that was the problem.
> [Humanities, G3, line 124-136].

The above demonstrates the social capital that the student with a sibling at university has as compared to one who does not have. Also, the other student (who happens to be a first-generation university student), demonstrates how she has explored other means of getting assistance to acquire the writing skills. It is important to note that this is the same student who consulted a residence lab assistant (as discussed above). This student, however, demonstrates she is mobilising human resources and making decisions about who could assist her regarding her writing and technical needs.

Learning through practice or experimentation

Some students' responses reflect that they learned through their practices. For instance, a Commerce student's response indicated that he was not aware that UCT students are allocated a Google account that is synchronised with their myUCT (e-mail) accounts so they could access Google drive. When asked what they learnt from the collaboration activity, he responded:

> Really, I didn't learn anything because I had done it (collaborated) before. Apart from the fact that, even if you didn't have a Gmail account, you could access Google drive. I was an administrator, I used my personal Gmail account and added the rest of the group using their UCT accounts and so they could access the Google document using the UCT account [Commerce A, G1, line 95-98].

Some students from Commerce also expressed that they had discovered the affordances of Google documents, as they had collaborated on the shared task. These included editing, commenting, crowd sourcing and chatting. A participant said:

> Participant: It was also cool to have something like a chatroom where you could chat with your group members before writing anything out on the document. Before we didn't know that; we wrote everything in the Google document and then before we could submit, we had to remove all the discussions from the document.
> Researcher: How did you learn about the chat feature?
> Participant: I don't know, one of our group members found it . . . it just pops up . . . I don't know, with technology, you don't really, look for the instructions, you just figure it out as you go along [Commerce, G1, line 111-116].

In future, it would be important to explain the chat feature to students so as to support students' collaborative practices.

Furthermore, a social-emotional aspect that emerged from one of the Commerce focus group discussions, was that one student complained that his group members always ignored his input because "it was not good enough" [Commerce, G3, line 213], but he then acknowledged that he learnt that in any collaborative activity, he had to make meaningful input. This instance suggests that clear group guidelines and netiquette (that is, norms) for student engagement in collaborative activities need to be set by the lecturer and students. The above indicates that collaboration is more than the technical and cognitive aspects; it is also about the social-emotional interactions among the individuals involved, such as acknowledging others' contributions even if they are not used.

Learning through trial and error

One group learnt how to collaborate using readily available tools. A participant said:

> Participant: In our group, we initially didn't know the difference between Google documents and the other documents that we could use online so we initially used Microsoft Word Online . ...
> Researcher: How did you find out about that one?
> Participant: We just typed on the internet and in our group, there's . . .
> Researcher: What were you looking for on the internet?
> Participant: We were looking for an online document software and then we found that one and thought it was Google documents . . . and then one of our group members invited us through our e-mails . . . then there were also some settings that one could use to edit or comment on the document. We used those, and all participated. Then one day, when we got to the tutorial, we found out that we were using the wrong document. We started scratching our heads [were frustrated] because we thought we would have to re-type all the information and comments. Then one of the tutors helped us and told us that we could copy what we had in the other document onto a Google document. We were then excited.
> Researcher: I saw you, you were so excited. … It carried over all your content and the comments were still live . . .
> Participant: Yes, yes [Commerce, G3, line 48-64].

Although Microsoft Word Online was not the recommended tool for the course, students still learnt how to collaborate in an online space. In addition to that, the participants also reported in the above excerpt that they reverted to Google documents through the assistance of their tutor.

Gaining awareness through watching others' practices

When students were asked whether they were aware of any licences, such as copyright and Creative Commons, associated with YouTube, a participant from Commerce indicated that she was aware of copyright regulations because she had observed a friend who attempted uploading a video:

> I'm aware of one license; I know on YouTube, you cannot upload a video with other songs in it . . . songs that are copyright . . . like if you make a video yourself and you want to add one of the popular videos as the background, you can't use it because you don't have copyright to that piece of music . . . that's all I know [Commerce, G2, line 303-306].

Also, one Humanities student who had been creating his own music and uploading to YouTube said that he had only realised, the week before the focus group, that if he were to use someone's copyright material, he had to seek permission from the respective owner:

> . . . But last week, when I was uploading videos, I realised that someone asked for permission to use someone's instrumental to do a cover and I was like, 'Do you need to ask for permission?' And then I realised that you have to ask for permission [Humanities, G1, line 196-198].

These are potential indications that these two students will more likely become vigilant about YouTube copyright materials and how to reuse such materials, but that specific input about copyright regulations and alternative IP mechanisms (such as Creative Commons) should be taught in relation to course requirements.

The preceding discussion demonstrates that students can acquire digital content-creation literacies in various ways. Also, students are mobilising resources for learning what is required of their learning activities.

To summarise, drawing on the three dimensions of digital literacy used in this research, the data reflects that most students acquired skills related to the technical dimensions. In terms of this dimension, most Commerce students were using Google documents for the first time, hence they lacked technical skills. Related to this, some participants outlined that they learnt how to create and share Google documents. Also, one student learnt how to create a SmartArt graphic. Additionally, two Humanities students reflected that they acquired skills on how to use e-mail and Vula (access, download and upload assignments) and one of them also learnt formatting of word-processing documents.

Regarding the cognitive dimension, in Commerce there are mixed feelings about acquiring site-mapping (conceptualisation) skills because this role was assigned to other group members. Related to this, there is also little evidence of informed selection of appropriate software (because the site maps were created by other group members, either than the participants). The Humanities students carried out digital literacy practices such as evaluating and remixing (synthesising) information; in-text citation and referencing; and paraphrasing and developing arguments. Two students learnt how to construct an essay and use the Harvard system of referencing. Related to the above, the Humanities students came to know which information resources (such as JSTOR with the peer-reviewed academic articles) were most useful in their context.

Furthermore, the single instance regarding social-emotional aspects, reveals the importance of meaningful contribution when collaborating on a shared task. Etiquette protocols may need to be developed in the future.

5.7 Chapter summary

Digital device access and internet connectivity (which involves both awareness of how, and the ability to connect to technology) are critical factors for students' digital literacy practices at university. This research study found the ideological model of literacy useful in trying to understand what student digital literacy means in their different disciplines. The above discussion demonstrates that access to digital technology can both enable and constrain student digital literacy practices for learning at university. Additionally, student digital literacy practices are influenced by a variety of factors, such as the disciplines of the courses, learning and assessment activities, age, gender, enrolment in computing-related subjects while students were in high school and student familiarity with practices in which they engage for personal purposes; more so, those practices that are in the technical and of a social-emotional dimension. The findings also reveal that students either drew on their prior experience (which they accumulated whilst at high school); more so, with regard to digital literacy practices in the technical dimension, or contingently acquired the discipline-specific digital literacies to engaging in the respective practices. In future, it might be more appropriate for lecturers and tutors to be flexible about the tool, as long as it is suitable for the intended task.

Furthermore, the findings reveal that students acquired digital literacies through self-teaching; scaffolding from peers and senior students; practice and experimentation; and trial and error. It is advisable that the tutors teach students the process of creating and sharing a Google document rather than doing it on their behalf.

Chapter 6: Discussion

6.1 Introduction

This research study draws on the ideological model that posits that digital literacy is not simply a technical skill, but is a mastery of socially-evolved ways of using digital technologies within discipline-specific textual practices. At the same time, this study has adopted Gallardo-Echenique et al.'s (2015) notion of a digital learner, which focuses on ‘learners’ rather than ‘persons’, who have: varying technology experiences irrespective of generational age; realise the potentials and value of digital technologies in their environments and how they could use that for learning; do not have any presumed pre-defined learner characteristics; and adopt socio-cultural and learning approaches from their learner perspectives (Gallardo-Echenique et al., 2015). Based on this notion of digital learners, the findings of this research study reveal that there are more deep-seated factors influencing digital literacy practices of digital learners, rather than age *per se.*

This chapter discusses the findings in relation to the four research questions. In response to sub-question one, I used Ng’s (2015) adapted digital literacy framework, both as the conceptual (Chapter 2) and analytical (Chapter 5) framework, to discuss students’ digital literacy practices in the technical, cognitive and social-emotional dimension and their intersections. The framework was also useful in surfacing the entanglement of the respective digital literacy practices. I further used AT to complement this framework, to analyse student digital literacy practices within the two courses’ digital literacy events. I present the claims revealed by the findings in relation to each dimension and then, drawing on the ideologies of digital literacies as practices and some principles of AT, I discuss the individual (such as student volition and socio-historical practices) and socio-cultural factors (such as discipline, learning and assessment activity, course culture, historicity of discipline and university practices) that are likely to influence student digital literacy practices at university (sub-question two). In response to sub-question three, the enabling and constraining factors for students’ digital literacy practices are described. I found the social practice approach to digital literacy useful for surfacing a nuanced understanding of the complexity of the practices involved in student created content. I conclude this chapter by discussing how students acquired digital literacies for content creation, through immersion in disciplinary learning and assessment activities (sub-question four). The next section describes students' digital literacy practices and the factors influencing these practices.

6.2 Student digital literacy practices in their disciplines at university and factors influencing these practices

This section discusses student digital literacy practices in their disciplines and makes reference to some high-school learning and leisure practices, and personal practices while they were studying at university, as these tend to influence the students' digital literacy practices.

6.2.1 Technical dimension of digital literacy practices and factors influencing these practices

The technical dimension of digital literacy practices in this research study is viewed as an integration of capabilities of connecting and using technological devices (such as desktop computers, tablets, smartphones), connecting devices to the internet via wifi, 3G/4G or cable, connecting devices via Bluetooth technology for file sharing, downloading and installing applications on smartphones, managing digital content files; knowledge of data costs associated with interacting with web-based resources and activities; and practices such as capturing and editing digital images, videos and audio using smartphone, creating and formatting productivity software (word-processing, presentations, spreadsheets), using Google documents' features (such as creating, commenting, chatting and sharing content), signing on to the university e-mail and learning management system (LMS), Vula, sending and retrieving e-mail (including attachments) amongst students and with lecturers and tutors, downloading and uploading content onto Vula, navigating the internet, using a web browser, search engine (particularly Google) and downloading digital learning resources, setting up (including group management and privacy settings) and communicating via instant messaging and social networking tools, and conducting a Google search and interpreting search results on how to conduct a particular technical activity. However, searching also involves cognitive skills such as using appropriate search phrases, and the interpretation of search results involves the ability to decode text and videos on how to conduct the respective activity. The choice of one technology over the other also requires critical thinking skills.

6.2.1.1 Student access and use of technological devices at university

Students had access to mobile phones more readily than other devices both at high school and university. The findings reveal that the majority of students from both courses used mobile phones to access the internet when compared to other devices such as a desktop computer, laptop, tablet and an iPad. This is similar to other studies focusing on university first-year students in the UK (Jones et al., 2010), Australia (Corrin, Bennett & Lockyer, 2010) and South Africa (Brown & Czerniewicz, 2010; Thinyane, 2010). The devices were primarily owned by students, except for desktops, which were in the university computer laboratories. Related to this, three quarters of the students used three or more devices, with at least one of them being a mobile device. However, although the above may be a desirable picture for all first-year university students to enable their course engagements, three (3%) each had access to either the university desktop computers or a smartphone, while another three students did not have access to any device at all. The limited- or non-access to computers may impede these students' engagement with their learning activities. For instance, the three students who had access to desktops were confined to working in the computer laboratory and could not work from anywhere, anytime. Also, the three students with smartphone access still needed devices usable for teaching and learning purposes. These differences highlight the inequalities, in terms of device access, that exist amongst first-year students, particularly when students are off-campus, and are congruent with national research (Statistics South Africa, 2016). In fact, students' limited access to ICT infrastructure while they are outside their formal learning institutions such as schools and universities (which is evident in this research study), is a recognised contextual issue. For instance, according to the 2016 Statistics South Africa household survey, only 21,4% of the South African population owned one or more computers with these households being mostly in metropolitan and urban areas.

Related to the above, the 2013 White Paper for Post-School Education and Training (Department of Higher Education and Training [DHET], 2013) also acknowledges South African higher education institutions' students' uneven access to technology, hence the goal to improve technology access in higher education institutions (HEIs). The personal mobile device is part of the DHET end-user technology access initiative (Brown, Haupt & Hunma, 2018). Related to this, in January 2017, the university issued first-year students who are recipients of the National Student Financial Aid Scheme (NSFAS) fund, with laptops[29]. However, as indicated by the findings of the current study, there has not been much improvement between 2010, when related studies revealed inadequate technology access (Brown & Czerniewicz, 2010; Thinyane, 2010), and 2016, when data for this research was collected. This student inequality in terms of device (desktop computer, laptop, tablet and iPad) ownership at university could be related to the unaffordability of devices by parents (as demonstrated by the need for NSFAS).

6.2.1.2 Student access to internet connectivity at university

Students from both disciplines primarily accessed the internet on campus, using the university wifi. In descending order, the other locations were home, public library, cafeteria/restaurant/shopping mall, internet café and a family member or friend's place. The students primarily used 3G/4G connection at home and at a family member' or friend's place, and a wi-fi (hotspot) in the other locations, but 16 (16%) students residing at home or in other forms of accommodation had no internet access when off-campus. Student use of 3G/4G connection or smartphones as a primary means of internet connectivity at home was also revealed by findings of a South African study (Czerniewicz, Williams & Brown, 2009). This is not surprising as the 2016 Statistics South Africa report still revealed that only one-tenth of South African households had access to the internet at home in 2016, of which the highest percentage (23,6%) of households was in the Western Cape. By the same token, the findings reveal that staying on- or off-campus created disparities among students in terms of internet access, more particularly how they engaged with their learning activities. Students staying in the university residences had good connectivity as they had the privilege of accessing the university wifi. For instance, three students from the Humanities course, who lived in the residences, worked from their rooms and only went to campus to print documents, meaning that they could work from anywhere, anytime. However, one other Humanities student, who lived off-campus and had sometimes worked from home, couldn't afford the costs of data, which consequently impinged upon how she engaged with her learning activities. The above implies that it is almost impossible for students with limited or no access to internet connectivity off-campus to engage with web-based learning activities on an anywhere, anytime basis.

[29] https://www.news.uct.ac.za/article/-2017-03-20-free-laptops-for-hundreds-of-first-year-students

I assume that the 16% of students who reported not having internet access off-campus might have not been aware of the free internet quota at public libraries. For example, as part of the Smart Cape Access project[30], Cape Town libraries allow registered users 45 minutes per day, free internet access. Although the findings reveal that 60% of the students visited public libraries to access internet, further investigation would be necessary to reveal what the students did at the public libraries. However, in instances where students are required to upload assignments or engage in course activities, such as online collaborations, I would recommend that those living off-campus visit public libraries. Alternatively, students could use their smartphones as wifi hotspots for their laptops and tablets, as data tends to be very expensive nowadays[31]. Related to this, South African residents have formed the #datamustfall movement[32] that campaigns against the high rates of data, which has not yielded any positive outcome so far. By the same token, new developments after the #feesmustfall student protests[33] in 2016 were that South African internet service providers such as Vodacom, Cell C and MTN applied zero rating for the University-based learning materials to compensate for data costs, as students were accessing learning materials off-campus. The above implies that students' awareness about internet access locations, the capability to connect their devices to the university wifi while on campus, and to the internet via 3G/4G cards on their smartphones (hotspotting) when off-campus, as well as knowledge of how to use data efficiently, are crucial for a digital learner in this context.

6.2.1.3 Student use of productivity software at university

Word processing was the most highly-used productivity software by a large majority (93%) of students while Google documents were the least used by students. Although the two disciplines had quite different learning and assessment activities, students from both disciplines primarily created word-processed documents, presentations and spreadsheets for study purposes, while Google documents were used for both study and personal purposes. These findings are in line with those studies in the UK (Jones & Healing, 2010) and South

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[30] https://www.westerncape.gov.za/search/node/Internet%20
[31] Research ICT Africa Mobile Pricing: https://www.researchictafrica.net/pricing/ramp.php
[32] #datamustfall: https://twitter.com/hashtag/datamustfall?lang=en
[33] #feesmustfall: https://twitter.com/hashtag/feesmustfall?lang=en

African (Brown & Czerniewicz, 2008) that established that students' use of ICTs is more likely influenced by course learning activities than age.
With respect to factors influencing student technical practices, students' disciplines tended to be the most influential factor when compared to the other factors discussed below. Findings reveal that more Commerce students accessed and used technology than the Humanities students. This is in line with findings from a UK study (Margayan, Littlejohn & Vojt, 2011) where students from an applied science discipline had better access than those of a humanities discipline. In this research, a higher percentage of the Commerce students than those from Humanities used smartphones and laptops for learning purposes. Also, more Commerce students accessed the internet off-campus when compared to students in Humanities. This could be due to the fact that a higher percentage of Commerce students than those in Humanities had smartphones, which they may have been using at home to access the internet and for 'hotspotting' from their smartphones to their laptops. It was interesting, in this research study, to find that more Commerce students than Humanities students had accessed and used technological devices and the internet while at high school, as this indicates that the Commerce students had better prior computing experience than the Humanities students when they enrolled for university.

Similar to digital technology use, the creation of word-processed documents and presentations was influenced by the course discipline. More Commerce students created documents and presentations than the Humanities students. These findings concur with those reported in the UK (Margayan, Littlejohn & Vojt, 2011) where there were differences in use of technology between the technical and non-technical disciplines. Evidently, the above variances in my research study are related to the respective disciplines' digital literacies underpinning their course learning and assessment activities (LAAs).

Regarding gender, female students had better technology access than male students as was the case at high school, while there was no significant difference in how female and male students used productivity software at university. Moreover, female students had better internet connectivity when compared to male students. Also, a significant correlation was found between gender and smartphone access, which indicated that more female students than male students used smartphones to access the internet. This is an impressive finding about gender, more particularly because a recent international study by the Web Foundation still reflects that most of the 3.9 billion people in the world who do not have access to internet connectivity are women from developing countries (World Wide Web Foundation, 2017). The findings of the current study also are different to those of the World Wide Worx that reported developments in easing the gender divide in terms of internet connectivity in South Africa, where slightly more males than females had internet access (World Wide Worx, 2017). By the same token, more female students than male students accessed the internet from an internet café. These female students perhaps were more likely to search for online information for studies using their smartphones and visited internet cafés for web-based learning and teaching activities such as collaboration and uploading of content onto Vula. This supposition would need further investigation. The findings reveal that female students used smartphones to engage in social media activities such as posting and viewing content on Facebook, Instagram, SnapChat and communicating via WhatsApp for personal purposes. In the context of this study, female students are more likely to use social media to keep in contact with their families and friends when compared to their male counterparts. This could be related to young, female, first-year students' need for emotional support as they thrive socially and academically at university, as was found by Magunje (2013) in her study with UCT first year female science students.

In terms of age, there was a disconnected relationship between age and technology access. This concurs with findings from studies conducted in the UK (Jones, 2012), Australia (Corrin, 2014) and South Africa (Brown & Czerniewicz, 2010). In this research, although there was no correlation between age and device access, the older students had better tablet and iPad access when compared to the younger students. By contrast, the younger participants had better internet connectivity when compared to the older ones, with a significant correlation between age and public library internet access, indicating that the younger students were more likely to visit public libraries than the older ones. The younger students might have been aware of the free quota at public libraries, but this would need follow-up research. Furthermore, there was a significant correlation between the older students, and using other people's spreadsheets without revising them and sharing of Google documents, with the majority of the older students not conducting these practices when compared to the younger students. That is, almost all of the older students did not use spreadsheets created by other people (95%) and did not share Google documents (96%).

However, related to the above discussion on the technical practices, the findings revealed that there was a significant correlation between enrolment in a computing-related subject and student technical practices. This is in line with Goode (2010a) who noted that college students who had enrolled for computing-related subjects in high school, demonstrated a higher level of technological proficiency, when compared with those who had never enrolled for any. In the current research study, there was a significant correlation between enrolment in a computing-related subject and student sharing of files with teachers or classmates using cloud-based storage, such as Google drive and Dropbox, searching for a book using an electronic library catalogue, and submitting assignments by e-mail whilst studying at high school. In like manner, there was also a significant correlation between enrolling in a computing-related subject and sharing personal copies of word-processed documents, presentations, spreadsheets and Google documents; and sharing other people's copies of word-processed documents and spreadsheets. McKenna's (2010) research in South Africa noted how commonalities between the students' literacy practices that they bring with them from high school and the literacy practices of their chosen disciplines may enhance student success. The findings of this study, therefore, concur with those of McKenna's research.

In summary, the findings refute the over-stated relationship between the so-called 'digital natives' and digital technology access and use. These findings are in support of Jones, et al. (2010), Lai and Hong (2015) and Gallardo-Echenique, et al (2015) who argue that there are factors other than age that may help us understand students' use of digital technologies. In the current research study, students' digital literacy practices in the technical dimension are primarily influenced by discipline and the learning and assessment activities thereof, gender and prior experience of using technology at high school. At the same time, the enabling and constraining factors for students' technical practices are access to devices, software and connectivity at university and whether a student stays on or off-campus. The above technical practices, particularly in terms of accessing and using technology for learning, and creating word-processed documents and presentations, seem to be comparable in both courses, implying that technological knowledge and capabilities in using generic ICT (non-discipline specific) and productivity software are essential for any student enrolled at university.

6.2.2 Cognitive dimension of digital literacy practices and factors influencing these practices

Digital literacy practices in the cognitive dimension include identifying the need for information, reading mono- and multi-modal information with understanding, evaluating information, understanding and applying the ethical, moral and legal aspects (for example, copyright and Creative Commons, academic integrity) associated with content use and re-use, and ethically and legally using and communicating.

6.2.2.1 Identifying need for information

Allen, Karanasios and Slavova (2011) have noted that one's cognitive information-seeking behaviour is derived from an understanding of the information need. In the interviews, four participants described how they conceptualized what the tasks required before they engaged in information search. This lack of conceptualisation of the information required may be related to students' assumption that search engines, more so, Google, have 'all the answers' (see Section 6.3.3.1).

6.2.2.2 Knowledge and understanding of intellectual-property-licensing mechanisms associated with digital-content use and reproduction

The findings revealed that just over a half (52%) of the students had never been aware of any alternative IP mechanisms to copyright. In fact, the qualitative data revealed that some of the students were not clear about copyright, either. About a quarter of the students in both the Commerce course (26%) and the Humanities course (25%) had known about alternative IP mechanisms to copyright for more than a year, including as far back as high school. Furthermore, the majority of students (92%) could not identify OER used in their courses. Lack of awareness about OER was also evident in relation to the learning resources students used. In terms of age and gender, generally, more of the younger students and male students were aware of an alternative IP mechanism. Additionally, more of those students who enrolled in a computing subject than those who had never done so, were aware of an alternative IP mechanism.

6.2.2.3 Evaluating online information

The nature of the assignments or projects in which the students in the two courses were engaged tended to influence the information evaluation practices of the students. Commerce students were using online resources to look up definitions, concepts and examples, while the Humanities students were using scholarly articles to inform their arguments. More Humanities students engaged in the cognitive practice of evaluating information resources than Commerce students. It is evident from the findings that Humanities students were guided by their lecturers on the choice and evaluation of authenticity of online resources.

Regarding age, the older students evaluated online resources for currency and objectivity more than the younger students.An explanation for this practice could be linked to older students' personal use of online resources. There was no consistency in terms of gender and evaluation of resources and information. The evaluative practices were related to the students' disciplines, age and experience in using online resources that they had accumulated over time, more especially those students who had used Wikipedia whilst in high school. However, with the advent of user-generated digital content, including open educational resources (OER), such as Wikipedia that is quality-controlled, educators and HEIs need to reconsider the use of such resources in their courses, more so that students can also contribute content to OER.

6.2.2.4 Using and communicating information

In addition to Barton and Hamilton's (2005) historical point of a practice, Engeström (1999b) noted how the historicity of an activity system and socio-cultural histories of individuals may influence the literacy event (or activity system) being currently studied. Related to the historicity of practice, Šorgo et al. (2016) noted that ICT-rich university courses that are not designed to cultivate information literacy "have only a marginal impact on information literacy, although they may have some impact on ICT experiences and internet confidence" (p.1). Increased students' technology experience and searching of information on the internet (particularly, using Google search engine) are also evident in the current research. The above, therefore, suggests that LAAs designed to teach students the information literacy component of digital literacy should incorporate all the aspects of information literacy and that these be thoroughly assessed (Šorgo et al., 2016). In short, this calls for increased first-year student support in terms of information literacy, through collaboration between academics and library staff who explicitly plan the integration of information literacy into course curricula. As a case in point, findings of another research study conducted at a South African university demonstrated academics' shortfall in articulating the information literacy support that students require for academic writing (Noll, 2017). Engeström (2001) noted that it may take time for an activity to take shape or be transformed. Additionally, because the teaching of information literacy was not integrated into the curriculum, academics and library staff consequently provided disparate support to students which did not adequately assist students (Noll, 2017). From a practice perspective, Cooke (2016) reported that at a university at the UK, information literacy was embedded into the first-year curriculum as from the third week of the first semester; the information literacy sessions were run jointly by academics and library personnel and this yielded positive results.

With respect to the students' academic writing histories, in this research study it can be inferred from the qualitative data that students from both courses had rarely engaged in academic writing at high school. The findings reveal that Commerce students did not draw up a bibliography although this was a course requirement, while some Humanities students' limited knowledge of in-text citation and referencing of sources made them resort to using resources from the course reader rather than using the resources they found online. These findings suggest the need for teaching first-year students about IP and attributing sources of information such as citing correctly as well as drawing up a comprehensive and accurate bibliography or reference list.

Additionally, findings from the Humanities course demonstrated how student incompetency in paraphrasing impeded the students' essay construction process. Developing students' cognitive skills such as paraphrasing requires immersing students in academic writing activities. This may be overwhelming for the lecturers, but students could work with the specialised Writing Centre[34] personnel. The findings also revealed that students' inability to reference correctly impeded their volitional actions of finding resources for their essays. I would recommend that students visit their faculty guides such as the Humanities reference

[34] http://www.writingcentre.uct.ac.za/

guide for first-years[35] or the UCT reference guide The discussion demonstrates the complexity of what the writing process entails for both educators and students, more particularly with the diversity of these students' experiences in information literacy practices, such as synthesising and communicating information. At the same time, the student differences in these information literacy practices demonstrated above, reveal that the so-called 'digital natives' are not necessarily information literate. This is in line with findings from other studies in the UK (Kennedy, Judd & Churchward, 2008), Europe (Šorgo et al., 2016) and South Africa (Sentleng & King, 2012; Noll, 2017).

6.2.3 Techno-cognitive dimension of digital literacy practices and factors influencing these practices

The techno-cognitive practices include digital content creation and reproduction (see Section 6.3), searching for online resources for studies, curating and managing information and selecting appropriate software for carrying out the task at hand.

6.2.3.1 Searching for online resources for studies

Students used online resources to find information rather than to author or contribute content. In descending order, students from both courses primarily used search engines, YouTube, Wikipedia and Google Scholar to search for online learning resources. Most students used the Google search engine to search for information for their studies, and three of them even described this process as 'Googling'. According to Ito et al. (2008), young people use permutations such as "Googling," "Googled," and "Googler" which demonstrate how searching for information on Google has steadily become a normalised information-seeking process among youth. With the ubiquitous availability of the internet, it was not surprising to find that students used search engines as the primary source of information. However, student perceptions about Google being the 'go to' place raise concerns about students' critical literacy. For instance, one student stated that she used only Google for searching everything because she did not trust any search engine. This reveals that she was not aware that Google is a search engine too. Hence, understanding student histories of using technology and,

[35] http://www.lib.uct.ac.za/sites/default/files/image_tool/images/25/resources/Hum%20REFguide2015.pdf

particularly, the Internet for learning may be important (Basharina, 2007; Rodriguez-Manzanares, 2012).

Related to searching for information, the findings of this research study reveal that the majority (91%) of the students had been searching for information on the Internet for their studies, but very few (17%) used library electronic catalogues while studying at high school. This implies that, for the Commerce students, sourcing relevant information and images from business-related websites (such as OLX and Amazon) for their learning and assessment activity was a novel practice. Likewise, the few Humanities students who searched for scholarly articles on Google Scholar or in journal databases (such as JSTORand EBSCOhost) did so because they were advised to do so by their lecturers and tutors. This explains why students in both courses relied solely on Google for searching information. As Engeström (2001) noted that it may take time for an activity to take shape or be transformed, it is evident in the findings of the current research study that the library staff and academics have been working in silos. The above calls for faculty-focused library sessions for first-year students, on finding learning resources, using the UCT library system, including faculty-related databases, journals and recommended websites.

In addition to the above, the findings highlight that the teaching approaches and disciplinary differences influenced student choices and use of online learning resources. Regarding online videos, Commerce students used YouTube to enhance their learning of other courses (that is, not the one that was being studied), while Humanities students engaged with YouTube videos that were assigned by their lecturers, as part of a learning task linked to the LMS, Vula. A few Humanities students also mentioned that their lecturers shared links of YouTube videos that they recommended as learning resources.

With respect to Wikipedia, Selwyn and Gorard (2016) noted in an Australian study that, although Wikipedia is used to a lesser extent than search engines and YouTube, it has gained popularity in use by undergraduate students. The findings of the current research study also revealed a similar pattern, with Wikipedia being rated the third highly-used learning resource by the Commerce students. In fact, there was a significant correlation between the Commerce course and searching for information using Wikipedia, and the Humanities course and searching for information on Google Scholar. It is likely that this is due to the nature of the course learning and assessment activities, because the Commerce students were looking up definitions, concepts and examples, while the Humanities students were reading scholarly articles that helped them construct arguments. These findings concur with some studies on undergraduate students in the US where students in the sciences were more likely to use Wikipedia than those in the Humanities, because students in the sciences more often look up solutions (Kim, Sin & Tsai, 2014).

Nevertheless, the findings reveal that students from both disciplines used Wikipedia to supplement sources of information recommended by their lecturers such as textbooks and journal articles (which are often difficult to comprehend due to the academic discourse). That is, students used Wikipedia to acquire an understanding of course-related concepts, and as a bibliographic source for useful resources. This practice was also reported in studies in the US (Kim, Sin & Tsai, 2014) and Australia (Selwyn & Gorard, 2016). Findings of the current study also reveal that students did not extract any content directly from Wikipedia. This seems to be because the students' high school teachers, university lecturers and the students themselves were concerned about the credibility and authority of Wikipedia.

Related to the nature of information that is relevant to the respective disciplines, more Commerce students searched for information using SlideShare, iTunes and TedTalks, while a statistically significant number of Humanities students did not use these platforms.

With respect to age, more younger students intentionally or unintentionally used institutional open content repositories when compared to older students. Also, 42% of this age range was aware of alternative IP mechanisms, which could explain why they searched for information on institutional open content repositories; whereas a statistically significant number of older students (93%) did not search for information on institutional open content repositories. Perhaps, a possible explanation for the few older students (7%) using these resources is that they had some knowledge about the concept of OER (and OpenUCT) (as the data reveals that they were enrolled in the Commerce course, which introduced the concept of OER in tutorial sessions, lectures, orientation/induction sessions; and course website/LMS). Alternatively, students may have made their choices based on the examples put forth in the questionnaire. In the focus groups, three students related that they used Khan Academy because they found the videos useful and perceived that Khan Academy provided a legitimate collection of resources. The findings reveal that the highest percentage of students who used them was unaware that they were interacting with OER. This might be because there seems to be less attention given to guiding students on resource licencing in the Humanities Course, but perhaps even with the Commerce course, as student introduction to OER was presented only at the beginning of the year. The above differences could be attributed to course culture rather than age. First-year students' lack of awareness of resource licencing was also noted as a concern in a South African study where only 14 out of 1001 first-year students reckoned that they had legally downloaded resources from Wikipedia (Czerniewicz, 2017). The above confirms Beetham et al.'s (2012) notion of open learning where students can gain access to openly licensed resources and opportunities through standard internet searches.

With respect to gender, although no correlation was found between gender and use of online resources while at university, there was a correlation between being female and searching for information on the internet for studies whilst students were at high school. It is of interest to other researchers that this study found that female students engaged with the internet and Wikipedia for learning activities more frequently than male students at university and that these findings contradict those of other studies (such as Jones et al., 2010; Kim, Sin & Tsai, 2014; Selwyn & Gorard, 2016) where more males than females are reported to be finding Wikipedia useful for finding information (Selwyn & Gorard, 2016), and the internet for finding information and communicating (Jones et al., 2010). A possible explanation for more female students than male students using the internet in the current research is that the female students had better device (smartphone and laptop) and internet access than male students. Parents of these female students may have bought them technological devices so they could work on their study-related matters in their residences even after hours. There is need for further investigation.

6.2.3.2 Curating and managing information

Two-thirds (63%) of the students bookmarked their resources mainly using other bookmarking systems (that is, not listed as examples in the questionnaire) and Pinterest, while just less than a third (23%) of the students did not bookmark their resources at all. The substantial percentage of students not bookmarking sources could potentially explain why the essay writing of one male student from the Humanities course could be described by Sentleng and King's (2012) term 'patch writing' (where he used synonyms and changed the sentence structure, making the sentences seem like his own because he could no longer remember the sources of information. Patch writing has been reported in a South African study as one of the reasons why students plagiarise as they lose track of the source of information (Sentleng & King, 2012).

The findings revealed that more female students than male students used Pinterest to curate their resources. The positive correlation between being a female student and curating resources could be attributed to recreational practices, with female students being more familiar with pinning media resources when compared to male students. Overall, curating and managing information seemed to be related to the students' experience in using online resources for personal reasons rather than within their formal courses at university. The above discussion demonstrates the importance of the relevance of the literacy practices that students bring with them to university.

6.2.3.3 Selection of appropriate productivity software for responding to learning and assessment activities

Students from both courses mainly used productivity software, as elaborated above, but Commerce students also selected software to use for creating a site map for their learning and assessment activity. In addition to groups collectively brainstorming about their site maps, seven Commerce students appropriately chose a readily available Word feature, SmartArt to draw their site maps, instead of the site-map tool that was introduced to them by their lecturer. These students may have selected WordArt because of its functionality and availability. This finding is in line with that of research conducted elsewhere (Corrin, 2014) on students' appropriation of technology based on its functionality.

6.2.4 Technical and social-emotional dimension of digital literacy practices, and factors influencing these practices

Digital literacy practices in this dimension include communicating, sharing materials and discussing study-related matters with peers and university using e-mail, instant messaging technologies and social media (such as Twitter), establishing networks on professional platforms. The findings reveal that the above practices draw on one's volition to participate or not participate in different social networks. Gallardo-Echenique et al. (2015) noted that one of the characteristics of digital learners is that they readily realise the potentials of digital technologies in their environment and draw these into the daily learning activities. This is evident in the findings of this research study where students used digital technologies, that were not part of course requirements, for their learning purposes. That is, students adapted personal digital literacy practices in the technical and social-emotional dimension for learning purposes.

6.2.4.1 Establishing professional networks on social- networking sites

A very small percentage of the students (9%) did not have any networks on either of the four social networking sites (SNS), Facebook, Google+, LinkedIn and MySpace respectively. The majority of students with networks used Facebook for primarily establishing personal networks and Google+ for study-related networks. However, without anyone mentioning Google+ in the focus group and interview discussions, it may be that students confused Google+ with Google, as was noted in the World Wide Worx (2014) report on South Africa's population's use of social media. Additionally, although there were only two students, it was encouraging to note that first-year students were already building professional networks. For instance, two students established networks in LinkedIn to stay abreast of their career-related opportunities. This is in line with Gallardo-Echenique's (2014) findings in Spain.

6.2.4.2 Communicating, sharing materials and discussing study-related matters using instant messaging, and social-networking tools

The majority of students adapted their personal practices on instant messaging (IM) technologies and SNS (such as Twitter) for their study purposes. A higher percentage (74%) of students communicated using WhatsApp for both study and personal purposes compared to other IM tools such as MSN messenger, Yahoo messenger and WeChat. This is not surprising as a survey conducted by a mobile market research firm, On Device[36], back in 2013, found that WhatsApp was the most popular messaging application in South Africa, Brazil and Indonesia, and second most popular in the U.S, after Facebook messenger.

[36] https://ondeviceresearch.com/blog/messenger-wars-how-facebook-lost-its-lead; https://techcrunch.com/2013/11/26/on-device-mobile-messaging-apps/

Although IM was not a course requirement, over three-quarters of the students found it to be the most convenient method for communicating and sharing study-related materials compared to e-mailing. The findings revealed that students initiated WhatsApp groups due to their learning needs such as deliberating about face-to-face meeting times, discussing course content or sharing activity-related materials. These findings are in line with those of a related study conducted in Ghana (Tawiah, Nondzor & Alhaji, 2014), but are contradictory to those of Gallardo-Echenique (2014) who found that most of their students used Facebook/MySpace when compared to IM via WhatsApp to communicate with their classmates.

Clearly, contextual issues and student familiarity with the affordances (such as group management) of WhatsApp and Facebook are at play here. As discussed above, WhatsApp is widely used in South Africa as compared to the US and Europe, while it is the inverse with Facebook[37]. Also, with the majority (77%) of students in the current research study, having experience of forming groups in chat technologies while they were at high school, the ubiquitous use of WhatsApp was not surprising. Whereas some US students (Bullen, Morgan & Qayyum 2011) and Spanish students (Gallardo-Echenique, 2014) were familiar with Facebook. In addition to the above, the use of Facebook was also encouraged by lecturers in Gallardo-Echenique's (2014) study where students also communicated with their lecturers using Facebook. Oddly, although the current findings suggest that students found IM useful for learning, it also turns out that one student's disposition towards WhatsApp made her fail to realise the potentials and value of IM for supporting her learning.

With respect to use of SNS, the majority (70%) of the students engaged in microblogging. A large percentage (62%) of students tweeted social information, while about half of the students tweeted and retweeted study-related information. This is noteworthy for researchers interested in students' use of social media for study purposes as these findings run counter to those from studies conducted in New Zealand (Lai & Hong, 2015) and Australia (Selwyn & Gorard, 2016) where Twitter was among the least frequently used digital technologies for study purposes. Moreover, findings from related studies in the UK (Reed, 2013) and South Africa (Brown, Czerniewicz & Noakes, 2016) revealed that Twitter was less frequently used

[37] https://www.internetworldstats.com/facebook.htm

by students when compared to Facebook. In the UK study, it was only after microblogging was integrated into one of the modules that students' communication amongst themselves and with their tutors out-weighed Facebook's use. It is important to note that in the current research study, those who tweeted or retweeted study-related information did this out of their own volition and because of their experience in tweeting and retweeting social information.

With respect to potential factors influencing student practices in the technical and socio-emotional dimension, there were no significant differences between student age and gender, and their use or non-use of IM and SNS. These findings are in line with those of Gallardo-Echenique (2014). In the current research study, although the older students and female students seemed more active on WhatsApp, there were no significance differences between age and gender, and communicating on WhatsApp. The same applies with SNS; more older students and female students were active on Twitter when compared to the younger students and male students. With no significant correlations found between student age and gender, and the respective practices carried out on these platforms, the above suggests that the students carried out the above practices from their own volition and because of prior and/or personal experience while at high school or university respectively. Related research (Kennedy et al., 2010) revealed gender-related differences where female students were more active on SNS than male students, but there were inconsistent differences in terms of age. Also, similar to the findings of the current research study, Jones et al. (2010) concluded that female students were more active on SNS when compared to male students, although there were no statistically significant differences in terms of gender. In the light that these studies contributed to the controversial literature on gender differences and use of SNS, it might be useful to determine why students are using social media. For instance, a study reported that more male students than females students used SNS for task-oriented reasons (Lin & Lu, 2011), while another study found no gender differences in students' use of SNS for finding information for study purposes. Overall this suggests that the learning context in which IM and microblogging were used in the current study is more important than age or gender.

Writing about the US context, Bullen, Morgan and Qayyum (2011) further noted that numerous factors influence student choice of technologies, other than age. Including student familiarity with technologies (which was also found in this study), the factors are immediacy (facilitates immediate response), cost and context sensitivity. The findings of the current research, which also concur with Gallardo-Echenique (2014), reveal that students used IM with the intention of receiving immediate response from their classmates. Related to cost, in line with findings from Tawiah, Nondzor and Alhaji (2014), students mainly used WhatsApp because it is free. According to WhatsApp (2017), WhatsApp is free as it uses users' phone internet connection or wifi connection[38]. Because students have free wi-fi connection at the university, they can access social media from their smartphones if they are capable of connecting their mobile devices accordingly. Regarding Twitter, students might have found it convenient to use, as was concluded in a similar study in the UK (Reed, 2013), but this would need further investigation. Students in the current study used technology in context-specific ways where they used WhatsApp for informal communication with their classmates, and Twitter for sharing study-related information, but used e-mail when sharing files with classmates (in the Commerce course) or communicating with their lecturers, tutor and senior students in more formal ways such as submitting assignment drafts (in the Humanities course). This notion of context sensitivity infers that students were able to identify which technology was better suited to a given task, in keeping with findings from Bullen, Morgan and Qayyum (2011) and Gallardo-Echenique (2014).

However, the findings reveal a contradiction between the way the university engages with students (that is, through formal email) and the way the students engage (that is, using smartphones and personal email accounts). The differences between formal and informal channels of communication have been highlighted elsewhere (Gallardo-Echenique, 2014). In this research, students seldom checked their university emails on their smartphones, but instead were more likely to use their personal e-mails (mainly, Gmail) for informal communication with family and friends or even the University Facebook page to keep abreast with university updates, thereby missing out on important information from the course and university at large, sent to their official university e-mail. These students were unaware that they could set up their UCT mailbox on their mobile devices. That is, students' lack of digital literacy required by the university is impeding their communication with the university. McKenna (2010) notes how some literacy practices that students bring with them into university may be unsuitable to meet the expectations of the discipline and university.

[38] https://faq.whatsapp.com/en/android/20965922/

6.3 Digital-content creation and reproduction, and factors influencing these practices

As explained in Chapter 2, digital content creation includes creating any form of digital content (monomodal and multimodal) from scratch or reproducing existing content. The creation can be an individual (likely to be practices in the techno-cognitive dimension) or collaborative endeavour (likely to be practices in the cognitive and social-emotional dimension). Reproduction includes adapting others' content for own use and redistributing (adapting others' content and subsequently sharing) other people's resources. These practices require knowledge about ethical, moral and legal aspects associated with content use and reproduction (discussed in section 6.2.2.2).

With respect to individual production of resources, the findings revealed that in terms of multimodal resources, the most frequently produced resource by students were images, followed by videos, while the least were blogs, websites and Wikipedia. Commerce students produced more images when compared to the Humanities students for both study and personal purposes. The correlation between the Commerce course and image creation implies that image production was driven by course pedagogy, but informed by the students' experience of producing images for personal purposes.

In terms of websites and Wikipedia, students from both disciplines mainly searched for and consumed information from these resources rather than contributing content. These findings are similar to those of research conducted on first year students in Australia (Corrin, 2014) and South Africa (Thinyane, 2010) where a high percentage of their students had never created their own blogs, websites or contributed content to Wikipedia sites. In relation to the curriculum, Ng (2012a) noted in her study with undergraduate pre-service teachers that students need a pedagogical purpose for engaging with online activities such as creating wikis, blogs and websites. The above implies that to inculcate the culture of digital content creation among students, activities that are most likely to encourage a creation and participatory culture should be embedded in course pedagogical approaches. For instance, effort is being made to use learning and assessment activities to encourage students to produce videos (Cronje, 2010), as well as to author and edit Wikipedia (Jones, 2015). At the same time, it is noteworthy that the educational purpose has to drive the technology (Oliver, 2011; Price & Kirkwood, 2014) and not the other way around.

With respect to factors influencing digital content production, although these were small percentages, more of the younger students (19%) created podcasts when compared to the older students. Findings on the limited or almost non-creation of podcasts concurs with those of Thinyane (2010), indicating that not much has changed in terms of young first-year students' patterns of digital content creation. These findings are also in accordance with Brown, Czerniewicz and Noakes (2016) who noted that age is less important than students' self-determination to create digital content, more so, if content creation is not part of the curriculum. That is, the few younger students in the current research study created podcasts of their own volition.

No correlations were found between gender and the creation or re-use of digital resources, although female students created more digital resources compared to male students. A higher percentage of male students created videos than female students, while a higher percentage of female students created images. This gender difference between video and image creation might be attributed to differences in recreational practices as noted by Goode (2010a), who found that more males liked interacting with videos than females. In the current research study, more females reported capturing and sharing images on social media such as Facebook, Instagram and SnapChat.

The findings also revealed an emerging reproduction practice where 14% of all the 103 students adapted other people's presentations, while 8% of them adapted Google documents. Additionally, more of those students who enrolled in a computing-related subject whilst in high school engaged in this practice, as compared to those who had never enrolled in any computing-related subject. Forty percent of the former group adapted other people's presentations and 25% of them adapted other people's Google documents.

In addition to the above-mentioned digital literacy practices, the Commerce students were required to engage in a techno-cognitive activity where they collaborated online using Google documents. However, the findings suggest that students' lack of technical capabilities can disrupt student techno-cognitive digital literacy practices. This concurs with Goode (2010b) who noted that students' computing experience can influence how they engage in their academic work. In the current research study, there was some tension between the technical and cognitive dimension of the collaborative activity in the Commerce course. Seven students reported how their lack of technical capabilities (in terms of Google documents) impeded their collaborative creation of an electronic business concept document. Consequently, these students spent some time acquiring skills on how to create a Google document rather than working on the collaboration task. By contrast, in one group, a student who had used Google at high school volunteered to create and share the document with his group members. McKenna (2010) noted how students' literacies accumulated prior to university could help them 'crack the code' of the academic tribe or disciplines in which they enrol at university.

Hence, understanding student histories of using technology for learning may be important (Rodriguez-Manzanares, 2012). In this research study, in the respective order, 42% and only 22% of the students, collaborated with their peers on an assignment and shared files with teachers and classmates using cloud-based storage whilst at high school. Considering that most students had never used Google documents while studying at high school, it may be essential for tutors to run a hands-on session on how to use Google documents. While I was piloting my research with students in this course, I trained students on the use of Google documents but, during the focus group, students reported that: 1) most of them did not attend the session because they perceived the session as an add-on to their class slots (and it clashed with other tutorial slots), and 2) those who attended the sessions were subsequently assigned the task of creating and sharing the documents with the rest of the group members because they were the only ones who were sufficiently knowledgeable. This suggests that any intentional inclusion of technology in a learning and assessment activity may require the educator to plan for overt instruction where course or digital literacy tutors could support students on how to use the respective tools where necessary. This is based on the findings that reveal that, although immersing students in a learning and assessment activity (situated practice) was sufficient to get students to explore how to acquire the Google functionality and associated practices, this took up a lot of student time.

With respect to digital literacy practices in the cognitive and social-emotional dimension, the findings revealed that although less than 20% of the students collaboratively developed word-processed documents, spreadsheets, presentations and Google documents, there was a correlation between enrolling in a computing-related subject whilst in high school and this digital literacy practice. Also, a significant correlation was found between enrolling in a computing-related subject whilst in high school and collaboratively developing images and videos.

With respect to the intersection of the cognitive and socio-emotional dimensions, these Commerce students were collaborating on a shared task. A social-emotional aspect that emerged from one of the focus group discussions was the importance of acknowledging others' input when collaborating on a shared task. Members of one of the Commerce groups ignored a student's input because they seemed not to find value in it. This instance suggests that, firstly, lecturers and tutors need to raise student awareness about the need to acknowledge others' input in collaborative activities, irrespective of the input being incorporated or not in the content of the end-product. Secondly, in the future, lecturer/or tutors and students may need to develop group interaction guidelines and netiquette for student engagement in collaborative learning activities.

From a digital-learner perspective, it is encouraging to note that a few students engaged in mono-modal and multi-modal resource production and reproduction, rather than only sharing or downloading (use 'as is') resources for their own use. That is, they are producers and not solely consumers of information.

Table 6.1 provides a summary of student digital literacy practices and the influencing factors.

Table 6.1: A summary of students' digital literacy practices and their influencing factors

Practices	**Factors influencing practice**
Technical dimension	
Accessing and using devices for learning	• Discipline, learning and assessment activity • Gender • Student stays on or off campus
Accessing and using internet for learning	• Discipline, learning and assessment activity • Gender • Student stays on or off campus • Age • Volition (with respect to hotspotting)
Creating word-processed documents and presentations	• Discipline, learning and assessment activity
Using other people's spreadsheets without revising them	• Age
Creating a shared Google document	• Learning and assessment activity • Prior experience in sharing files using cloud storage at high school
Sharing own copy of word-processed documents, presentations, spreadsheets and other people's copies of word-processed documents and spreadsheets	• Enrolment in a computing related subject at high school
Sharing own copies of Google documents	• Age • Prior experience in sharing files using cloud storage at high school • Enrolment in a computing-related subject at high school
Cognitive dimension	
Applying knowledge and understanding of copyright and Creative Commons licenses	• Prior knowledge as far back as high school • Course culture (with respect to understanding of licences and use of OER)

Evaluating information	• Discipline, learning and assessment activity • Gender • Age • Personal experience (accumulated over time) in use of online resources
Using and communicating information	• Historicity of practice (with respect to academic writing support at university) • Students' high school academic writing experience (academic writing histories)
Techno-cognitive dimension	
Producing podcasts	• Volition • Age
Producing images	• Discipline • Experience in producing images for personal purposes • Enrolment in a computing-related subject
Adapting other people's presentations and Google documents	• Enrolment in a computing-related subject • Learning and assessment activity
Searching for online information	• Discipline, learning and assessment activity • Prior experience in searching for information whilst in high school • Enrolment in a computing-related subject (with respect to YouTube videos and open content repositories) • Teaching approach (with respect to YouTube videos) • Historicity of practice (with respect to library and academic staff support) • Age • Course culture (with respect to non-use of Wikipedia)
Curating and managing digital resources	• Experience in curating digital resources for personal purposes • Gender
Selecting appropriate productivity software	• Learning and assessment activity • Functionality and availability of software

Technical and social-emotional dimension	
Establishing networks on LinkedIn	• Experience in using social networks for personal purposes while at university • Volition
Sharing materials and discussing activities using WhatsApp	• Prior experience in forming groups in WhatsApp • Socio-cultural practice (with respect to the differentiated use of WhatsApp and Facebook messaging) in South Africa • Experience in communicating via WhatsApp for personal purposes • Volition • Functionality and immediacy of IM • Perceived value of technology (WhatsApp) for learning
Tweeting and retweeting study-related information	• Experience in microblogging using Twitter, for personal purposes • Volition
Cognitive and social-emotional dimension	
Collaborating on a shared task	• Learning and assessment activity (with respect to Commerce course)
Collaboratively developing word-processed documents, spreadsheets, presentations, Google documents, images, videos	• Enrolment in a computing related subject
Social-emotional dimension	
Acknowledging others' input when collaborating on a shared task	• Lack of prior experience in digital collaboration practices

Figure 6.1 is a visual summary of the students' digital literacy practices and the factors that influence them.

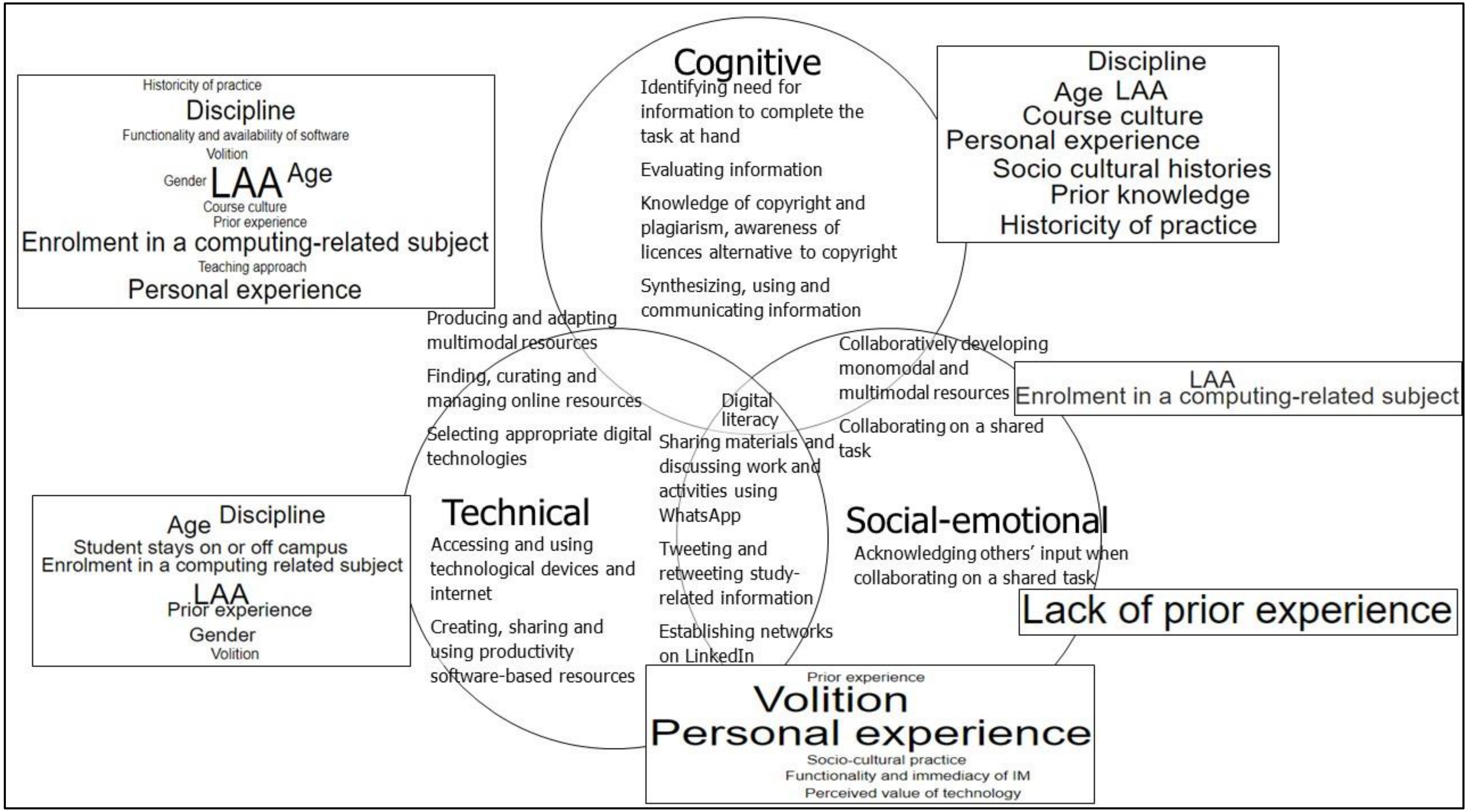

Figure 6.1: Student digital literacy practices and the influencing factors

The above discussion revealed an undue influence of student enrolment in a computing-related subject whilst in high school, on their technical practices (Figure 6.1). This demonstrates how students transferred their technical practices across the high school and university context, more so, when these practices are integrated into the course curricula by means of LAAs within courses. Furthermore, Section 6.3.4 demonstrates how students adapted their digital literacy practices between the personal and academic context. The adaptation of digital practices across students' personal and academic lives was also noted at a US high school (Gurung & Rutledge, 2014) and at a South African higher education study (Brown, et al., 2016). In addition to the above, it is important to note that this research study found that the student digital literacy practices in the technical and social-emotional dimension, such as establishing professional networks, communicating, sharing materials and discussing study-related matters using instant messaging and social networking tools, seemed to be intuitively transferable from the students' personal contexts to their academic contexts; a finding that contradicts that of other studies (Margayan, Littlejohn & Vojt, 2011; Corrin, 2014).

Furthermore, there has been a controversial debate around the translation of technical skills into cognitive skills where digital natives proponents (Prensky, 2001; Tapscott, 1998) assumed that competency in technical skills translated into competency in learning with technology, whereas those counter to this (Kennedy, Judd & Churchward, 2008; Littlejohn, Beetham & McGill, 2012), emphasised that technical skills do not necessarily translate into cognitive skills such as information literacy required for learning. The current research study resonates with the research of the latter authors. Additionally, the little to no academic writing experience that students have when they enrol in university suggests a need for better integrated support from lecturers, and library and writing centre staff.

With respect to individual and collaborative production and reproduction of digital content, findings of the current research study reveal that there are emergent digital content-creation practices among these first-year HE students, more so when learning and assessment activities foster such practices. Students tend to draw on their technical skills acquired from the computing-related subjects whilst in high school or adapt digital literacy practices from their personal contexts to engage in discipline-specific digital literacy practices. However, the teaching and learning systems (as demonstrated by the historicity of practice) seem to be moving at a slow pace in taking shape to become conducive environments ideal for digital content production and, in turn, digital knowledge production. I therefore, recommend that courses implement more learning and assessment activities that foster digital content creation and collaboration, and that HEIs support such endeavours so as to inculcate a culture of digital content creation among students. This would hopefully, in turn, prepare students in becoming digital knowledge producers (as was described in Section 1.1, also see Figure 1.1).

6.4 Discipline-specific frameworks of digital literacy at university

Students' digital literacy practices and choice of digital technology for learning were found to be heavily influenced by the digital literacies of the respective disciplines. As Gee (2010) had noted that the socio-cultural practices determine the different ways of using digital technologies, it is evident in this research that the different disciplines value different digital literacies. The implication is that common digital technologies were used in both disciplines, but they were used in different ways. This implies that for students to be considered digitally literate, they have to master the discipline-specific digital literacies. That is, students have to master the Discourses of their disciplines. The practical implication is that educators need to foster student development in discipline-related digital literacies. This could be done through LAAs of the various courses within disciplines. Figure 6.2 and Figure 6.3 are an illustration of the complex terrain of Commerce and Humanities students' digital literacy frameworks.

The Commerce digital literacy framework

The findings reveal that the Commerce students engaged in digital literacy practices within all three dimensions to fulfil their curriculum-based activity requirements. Students engaged in technical practices such as accessing and using hardware and productivity software. The cognitive practices include evaluating information; applying knowledge and understanding of copyright and Creative Commons licencing associated with content use and re-use; conceptualising and developing a sitemap; and using and communicating information. Additionally, as the Commerce students collaborated on a shared task (at the intersection of the cognitive and social-emotional dimension), the social-emotional practices emerging from the findings involve acknowledging other students' input when collaborating on a shared task. Furthermore, with respect to the other intersections of the dimensions, the techno-cognitive practices include searching for online information; curating and managing digital resources; collaborating on online platforms; and selecting appropriate productivity software. The technical and social-emotional dimension includes practices such as establishing networks on LinkedIn; sharing materials and discussing LAAs on WhatsApp; and tweeting and retweeting study-related information. The use of social media implies that students also set up and created accounts on these social media platforms (Figure 6.2).

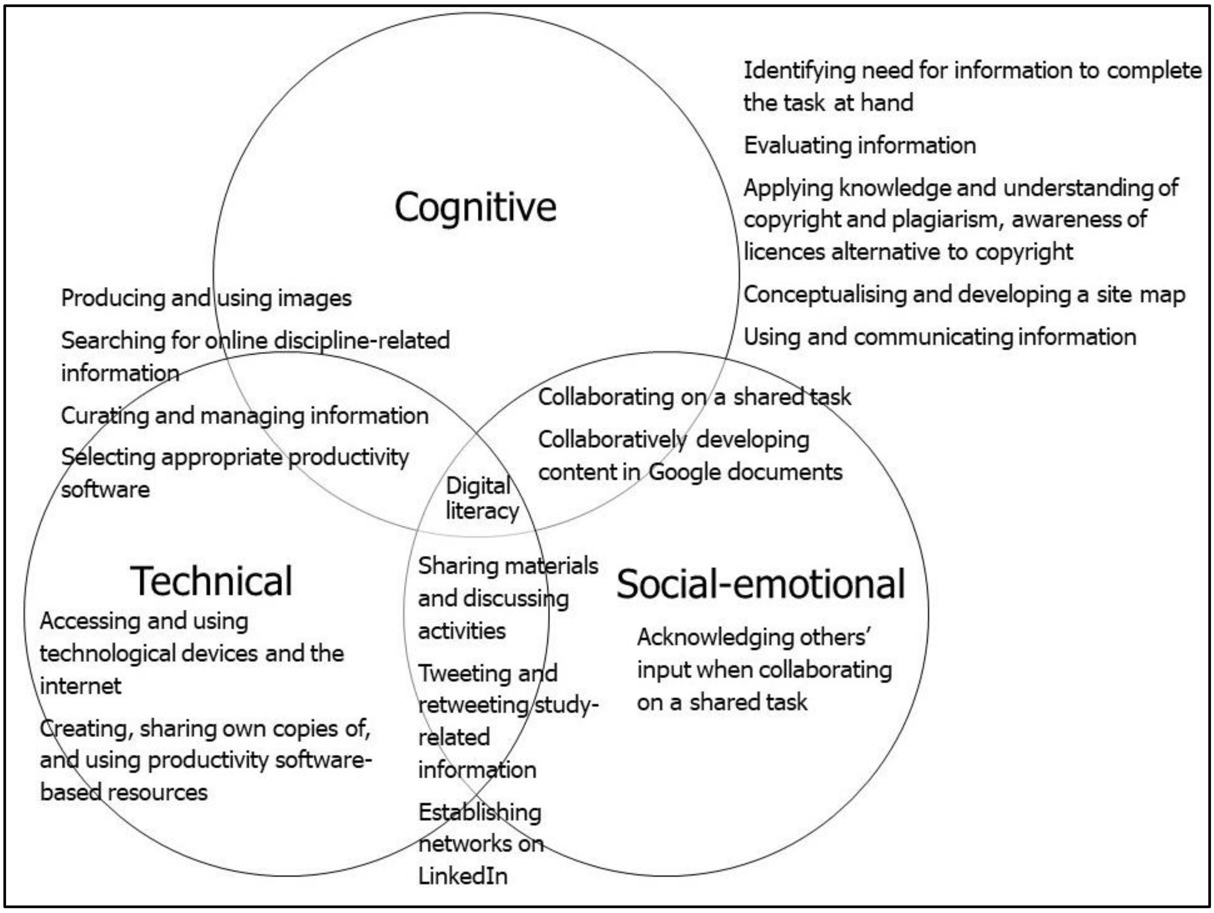

Figure 6.2: Commerce students' digital literacy practices framework

The Humanities digital literacy framework

The findings reveal that Humanities students only engaged in digital literacy practices within the technical and cognitive dimensions. As in the Commerce course, Humanities students engaged in technical practices such as accessing and using hardware and software. The cognitive practices include reading and summarising information from online resources; evaluating information; applying knowledge and understanding copyright and Creative Commons licencing associated with content use and re-use; and synthesising and communicating information. Furthermore, with respect to the other intersections of the dimensions, the techno-cognitive practices include searching for online information and curating and managing digital resources. However, as the Humanities' learning and assessment activities required students to work on individual tasks, no social-emotional practices emerged from the findings. The student practices in the intersection of the technical and social-emotional dimension include establishing networks on LinkedIn; sharing materials and discussing course work on WhatsApp; and tweeting and retweeting study-related information. As in the Commerce course, the use of social media implies that students personally set up and created accounts on these social media platforms. However, with respect to digital literacy development, the Humanities course did not promote any development of collaborative and social-emotional literacies thereof among its students.

Thus, the small social-emotional circle denotes that this dimension seems to be less important than the technical and cognitive dimensions in the Humanities course (Figure 6.3).

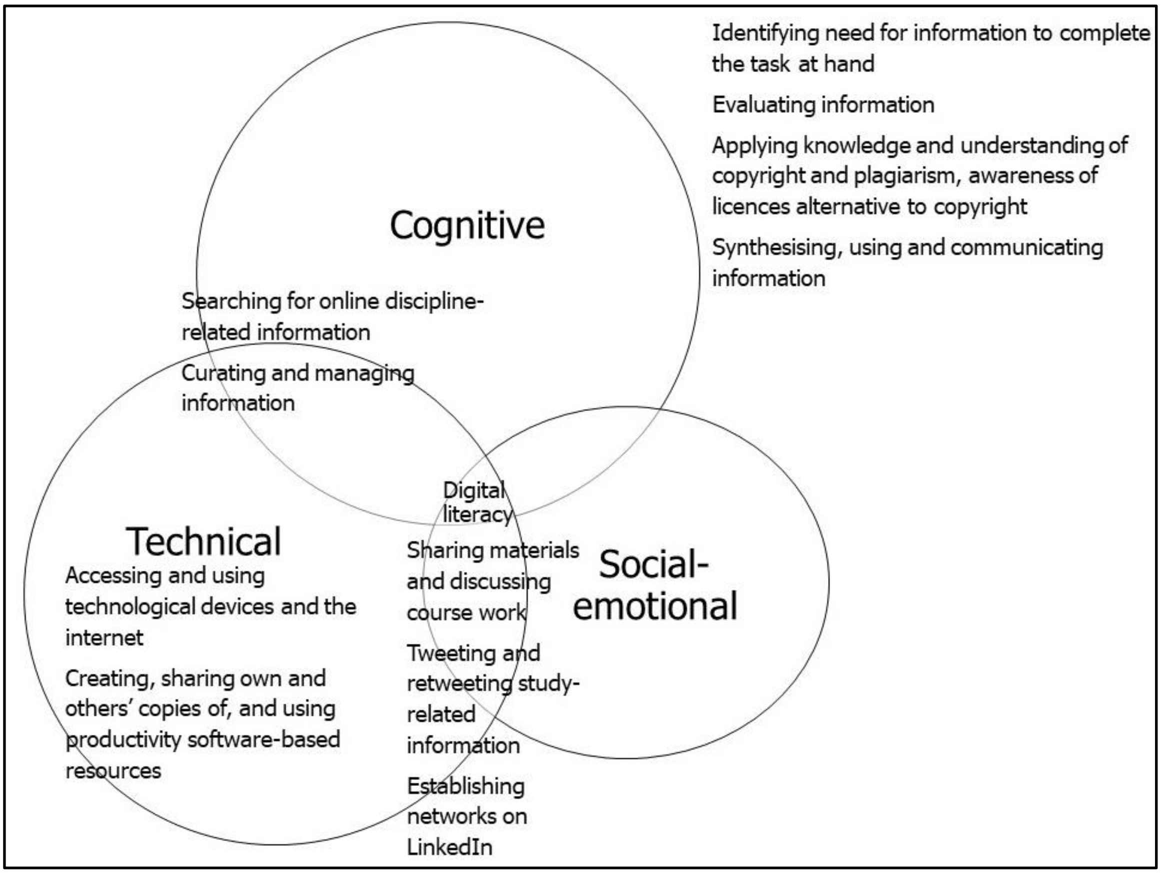

Figure 6.3: Humanities students' digital literacy practices framework

In addition to the digital literacy practices presented in the above frameworks, students from both disciplines also engaged in: techno-cognitive practices such as producing and adapting multimodal resources and digital literacy practices at the intersection of the cognitive and social-emotional dimension such as collaboratively developing monomodal and multimodal resources (see Figure 6.4). These practices together with those at the intersection of the technical and social-emotional dimension such as establishing networks on LinkedIn; sharing materials and discussing activities on WhatsApp and tweeting and retweeting study-related information were driven by volition, familiarity with the respective technology, enrolment in a computing-related subject and experience in using social media at high school and for personal purposes whilst at university, rather than the instructions of the LAA.

From a curriculum perspective, it may be interesting to note that findings of the current study suggest an association between student volition and digital literacy practices with a technical element. That is, students with prior experience in using certain technologies (such as podcasts, Wikipedia, IM technologies and social media) tended to be driven by volition to engage in digital literacy practices in the techno-cognitive, and technical and social-emotional dimensions. Educators could therefore, draw these digital technologies, that students frequently use for learning, into the curriculum to enhance digital content creation and communication. However, students' will and perceived value about technology for learning are crucial when integrating digital technologies into the curriculum. By the same token, literature (Brown and Czerniewicz, 2008; Ng, 2012) indicates that people use technology for a purpose such as completing learning and assessment tasks. Hence if students do not use a particular technology or engage in a digital literacy practice, they are not necessarily digitally illiterate. They may have used other technologies for personal purposes but were not asked to use them for learning purposes.

6.5 Enabling and constraining factors for students' digital literacy practices

Students' variable technology access at university is a constraining factor for their digital literacy practices. The discussion demonstrates that access to devices suitable for learning is still a challenge in South Africa. The discussion also suggests that the challenge of access to technology is related to student differences in technology access prior university. That is, students who had no technology access prior university were more likely not to have devices suitable for learning, such as laptops, tablets and iPads at university. Additionally, staying on or off-campus created disparities among students in terms of internet access. It was almost impossible for students with limited or no access to internet connectivity off-campus to engage with web-based learning activities on an anywhere, anytime basis.

The discussion also highlights how the availability of wifi connection at the university enabled students' sharing of materials and discussion of learning activities via WhatsApp. Since WhatsApp is free to users who use their phone internet connection or wifi connection, most students used the free wifi at the university to access social media from their smartphones. Students were also familiar with creating and collaborating in WhatsApp groups. They also had prior experience in Twitter, which afforded sharing (immediate delivery) of learning resources. Students, further, used their smartphones for social media and personal email accounts, such as Gmail, which is on most of their smartphones by default. However, tension arose between the way the university engages with students (that is, through formal email) and the way the students prefer to engage so students sometimes missed out on e-mails from their lecturers and the university. This implies that although students are digitally literate in terms of their personal digital literacy practices, their lack of the digital literacy required by the university impeded their communication with the university.

Moving from a critical realist perspective that seeks for explanations and an understanding of circumstances in specific contexts (Sayer, 2000; Maxwell, 2012), this research delved into the domain of the actual (that is, in events and experiences) to solicit some ‘actual processes’ (Maxwell, 2012) that led to students’ digital literacy practices in their discipline-specific contexts. Maxwell acknowledges that critical realism (CR) holds that “reality is more complex than any belief or theory can fully capture [such that] multiple valid understandings of any phenomenon are possible” (2012:657). It is in this context that critical realists emphasise the ‘causal role’ of mechanisms underlying visible events and individuals’ actions rather than ‘causes’. Sayer argued that “[causal] explanation requires mainly interpretive and qualitative research to discover actors’ reasoning and circumstances in specific contexts – not in abstraction from them” (2000:23).

In the current research study, the qualitative data of the mixed-methods approach used, together with AT were helpful in unpacking the factors that are discussed above, which were not directly perceptible. For instance, this research highlights how students (1) transferred their high school ICT experiences to their university digital literacy practices; (2) grappled with using OER because of their lack of understanding of licences alternative to full copyright; (3) of their own volition, established networks on LinkedIn, shared materials and discussed activities using WhatsApp, and microblogged study-related information. It is important to note that the identified factors are “situationally contingent; their actual context is inextricably part of the causal process” Maxwell (2012:36). For instance, students may only transfer their high school ICT experiences if the discipline-specific LAAs require such prior experiences. The above reveals that the students' digital literacy practices are influenced by a combination of factors (emergent properties), as illustrated in Figure 6.1. However, Bhaskar (2008) emphasised that, because real world situations operate as open systems, which are unstable by nature, emergent properties are more likely to change over time, even within the same context. In the context of the current research study, I am aware that there is need for: (1) annual engagement with first-year students' prior digital literacy skills and practices, and (2) constant (responsive) curriculum development, including adaptations of the LAAs and in turn, the emergent properties may change.

The next section describes how students acquired digital literacies within the two discipline-specific contexts.

6.6 Student acquisition of digital literacy practices in the two courses

The findings of this study reveal that students from both disciplines acquired digital literacy practices in the technical and cognitive dimension as a result of engaging in learning and assessment activities in their courses. Although it was a single instance, a Commerce student also reflected that he learnt how to cognitively and emotionally engage in the social networking environment. Related to the acquisition of digital literacy practices, Lankshear and Knobel (2008a) noted that literacy skills and practices are not learnt in a linear fashion and are not acquired the same way by all people. This was evident in the current research study.

6.6.1 How students acquired digital literacies

Gee (2008) asserts that secondary discourses – Discourses that we acquire in later stages of life (the discipline-specific digital literacies in the case of this research study) – are acquired through scaffolding, apprenticeship, trial and error, and practice within social groups, rather than overt instruction in formal teaching settings. Gee (2008) noted that literacy is developed through having access to the social practice within an authentic setting. This is also evident in the findings of this research study where students acquired digital literacies and related skills thereof, through self-teaching, scaffolding from peers and senior students, practice and trial and error in response to the learning and assessment requirements. The finding that students adopt a degree of self-teaching digital literacy skills in response to LAAs may be of interest to researchers and educators.

Acquisition through self-teaching

The findings reveal that some students acquired technical skills, such as creating Google documents and drawing Word graphics (SmartArt) through Googling how to do that. In turn, this learning action involved cognitive processes of strategically searching for useful information and choosing the appropriate tool for drawing graphics, respectively. At the same time, while self-teaching of technical skills demonstrates a sense of student motivation, it may be constrained by students' lack of both technical skills (such as operating Google or YouTube) and cognitive skills.

Acquisition through scaffolding from peers and senior students

The findings also reveal that students acquired technical skills such as creating a Google document, e-mailing and formatting Word documents through guidance from peers and senior students. This is evident with the Commerce and Humanities students; one student consulted digital literacy tutors, often called Tech Buddies at UCT; another relied on guidance of the residence computer laboratory assistants. Two Humanities students also learned some cognitive skills required in the writing practice; one student acquired information literacy skills such as referencing, and the other learned both the technical and cognitive skills of using software for proofreading, and grammar- and plagiarism-checking from senior students. One of the students was at an advantage of having a sibling in the same programme, while another student relied on a senior student from the same programme.

Acquisition through practice, and trial and error

In both disciplines, students acquired technical skills on e-mailing, searching for online information on Google and uploading their assignments on Vula, as an outcome of engaging in their LAAs. Some Commerce students discovered affordances of Google documents such as editability, comment-ability, crowdsourcing and chatting through experimentation. Also, in a single instance in the Commerce course, a student who had never engaged in a collaborative writing activity before, became aware of how to cognitively engage in an online collaborative activity. Furthermore, some Commerce students acquired online collaboration skills through trial and error. One particular group used another collaborative application instead of Google documents, but still acquired collaboration skills and ultimately transferred their collaborative document to Google documents, which was the tool recommended by the lecturer.

The above approaches to acquiring digital literacy practices, more so, technical practices, seem to be an emerging trend in international and South African universities. For instance, findings from Australia (Ng, 2012a; Corrin, 2014) and the Education Center for Analysis and Research (ECAR) (Brooks & Pomerantz, 2017) revealed that students were more likely to: turn to a friend, peer or tutor for technological support, or figure out how to solve technical issues on their own through trial and error, or search Google, YouTube, and online source, or read the manual (Corrin, 2014, Brooks & Pomerantz, 2017). Also, Kajee and Balfour (2011), in their study at a South African university found that students learnt these technical practices in an ad hoc manner such as self-teaching, trial and error, scaffolding from friends and attendance of university short courses. The last one though, was the least-used approach in the current research possibly because there are currently no formal short courses, but instead Tech Buddies who support students in the computer laboratories. Overall, the above discussion demonstrates that students are more likely to acquire digital literacy practices for learning when the practices are integrated into the course learning and assessment activities. This implies that teaching digital literacies involves immersion of learners in situated practice and scaffolding of learning activities by educators or peers where necessary. From a curriculum perspective, the above suggests that digital literacy learning be integrated into the learning outcomes, learning activities and assessment of courses.

6.6.2 Why the students acquired digital literacy practices

As discussed above, the findings reveal that the most common reason students acquired digital literacy skills and practices was to fulfil the formal curriculum-based activity requirements, implying that students acquired technical, cognitive and social-emotional skills and practices required for the social practices within their disciplines. In the same vein, Gee (1990) noted how social practice, acquisition of skills and practices, and identities are always implicated in one another. Related to this, Goode (2010a) noted the dynamic nature of technology identity as a result of new life experiences. In this research study, two students stood out as illustrative stories of how their digital identities emerged as a result of participation in situated practices. The findings reveal that the two students acquired digital literacies because performance of such practices gave them a sense of participation in the respective communities of practice, thereby also manifesting a digital identity. The two students who learnt how to use e-mail, Vula and word processing software felt a sense of belonging. Overall, the above highlights how the discipline LAAs and the associated digital literacy practices contribute to the formation of student digital identities (which is beyond the scope of this study).

Overall, as Goode (2010b) noted how students' computing histories (accumulated while studying at high school) influenced students' academic life at university, it is evident in this research study that students' computing histories influenced their digital literacy practices in the technical dimension at university. However, students, including those who have not 'grown up digital', acquired the digital literacy practices needed at university as the need arose.

The above discussion implies that immersing students in discipline-specific digital literacy practices by means of LAAs can potentially motivate students to acquire generic- and discipline-related digital literacy practices, thereby becoming digitally literate in these situated practices. That is, to build students' capacity on digital content creation, educators need to integrate the respective literacies into course curricula. The findings of this research revealed that LAAs instantiated individual and collaborative digital content creation in the Humanities and Commerce course respectively. However, I cannot make strong claims about the disciplinary differences because the LAAs and their modes (individual and collaborative) were different.

In further development of the digital literacy practices framework that was adapted from Ng (2015), and drawing on Lankshear and Knobel's notion of literacy being a "family of practices – literacies" (2008a:256), the above discussion can be represented as in Figure 6.4 below.

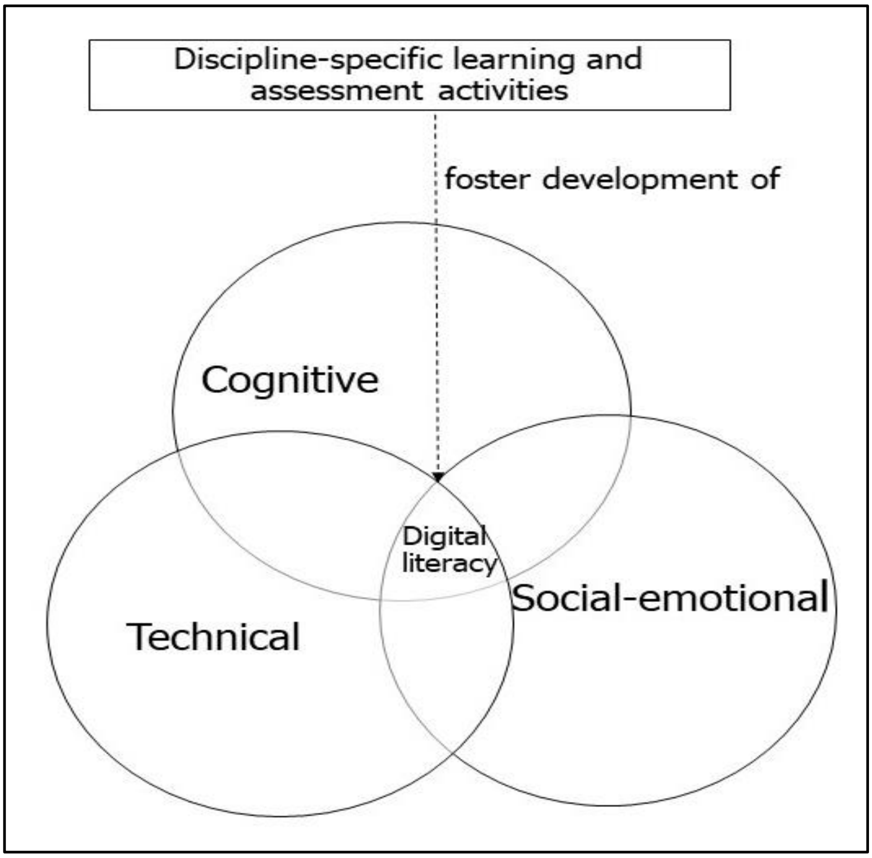

Figure 6.4: Development of students' digital literacy

In addition to the above, the research findings revealed an emerging and yet complex integrated network of aspects relating to digital literacy in disciplines. The findings also reveal that the LAAs drove students' desire to acquire the essential digital literacies for digital content creation in their respective courses. Students acquired digital content creation literacies in different ways, such as through self-teaching where students search online for helpful resources, scaffolding from peers and senior students who are more knowledgeable about the skills or discipline-specific cognitive practices, trying out a practice till they get it right (trial and error) and engaging in content creation (a practice) within their disciplines. The above implies that the best way for educators and HEIs to teach digital content creation literacies is using discipline-specific LAAs and not overt instruction of digital skills isolated from the context of practice. The above discussion highlights the value of peer and social learning as opposed to a formal instruction.

The findings of this study also revealed that there are personal and socio-cultural factors that have some form of influence on student digital content creation (Figure 6.5) that institutions cannot change but may engage with.

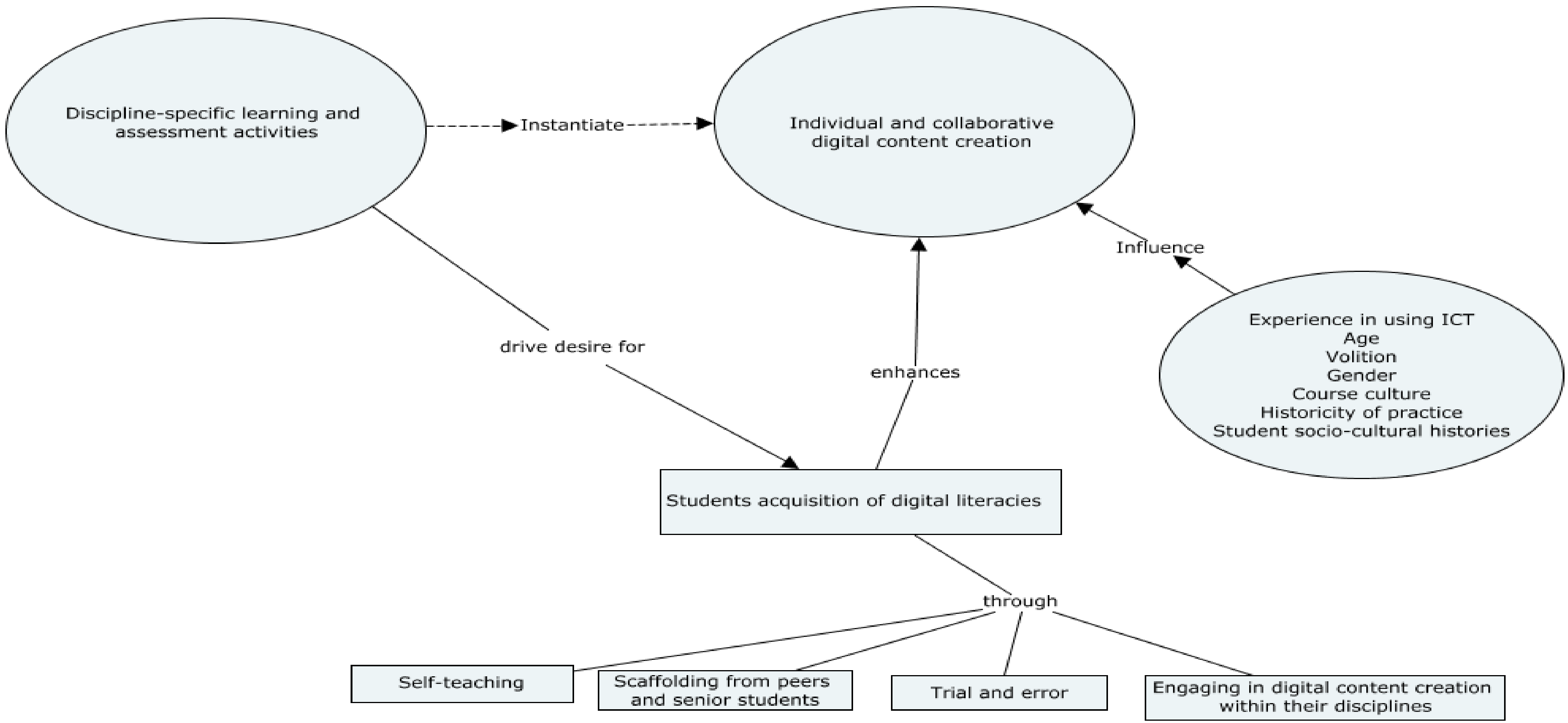

Figure 6.5: Student acquisition of digital content creation literacies and related factors

With respect to personal factors, educators and HEIs need to understand that first-year students are a heterogenous group that has different experiences in using ICTs and socio-cultural histories in terms of digital content creation. HEIs need to address digital technology access needs, improve their course culture and institutional practices to enhance digital content creation.

6.7 Chapter summary

This discussion has covered the findings in relation to the four research questions. The student digital literacy practices were discussed in comparison to the existing literature on digital learners. Furthermore, a social practice approach to digital literacy was used to contextualise students' content creation and the associated literacies, and to explain the socio-cultural factors influencing students digital content creation. Students acquired digital literacies for digital content creation in different ways as a result of their immersion in disciplinary LAAs. In the final chapter, I present the implications of this discussion and recommendations derived from this research study.

Chapter 7: Conclusion and Recommendations

7.1 Introduction

The purpose of this research study was to investigate how and why first-year higher education (HE) students acquire digital literacies and particularly, digital- content creation literacies within a discipline-specific setting. The postulation underpinning this research was that students could better acquire these practices within their courses as disciplines are better positioned to foster digital content and knowledge production. The specific questions that guided this research study were:

1) What are first-year HE students' digital literacy practices, in their discipline-specific settings?
2) What are the personal and socio-cultural factors influencing students' digital literacy practices in general, and digital content creation, in particular?
3) What are the enablers or contradictions influencing students' digital literacy practices in general, and digital content creation, in particular?
4) In what ways do first-year HE students acquire digital content creation literacies in their discipline-specific settings?

This research study cautions against the uncritical adoption of the concept of young students as 'digital natives' due to their age and exposure to technology; more so, students from developing countries such as South Africa. The findings of this study refute the over-stated relationship between age and positive technology access and use.

The socio-cultural factors of how students acquired digital content-creation literacies and the enabling and constraining factors for student digital literacy practices are presented in the descending order of their influential power. However, it is important to note that most practices are influenced by a combination of two or more causal mechanisms or conditions. Additionally, I make some implementation recommendations, articulate limitations of the study and make recommendations for further study.

7.2 Student acquisition of digital-content creation literacies

Students developed digital content-creation literacies and the associated skills through self-teaching, scaffolding from peers and senior students, practice, and trial and error. The discussion demonstrates that immersion in situated practice fostered the acquisition of skills and practices.

Findings of this research study demonstrate that the disciplines, and the learning and assessment activities (LAAs) thereof, instantiated student digital literacy practices for learning. This implies that course curricula are fertile grounds for fostering digital content creation and the production of discipline-specific knowledge thereof. Findings reveal that more Commerce students had technology access than the Humanities students. The most frequently owned device by both groups of students was the smartphone, subsequently implying that more of the Commerce students than Humanities students accessed internet 'hotspotted' from smartphone to their laptops when students were off-campus. The above reflects a sense of agency among students while, at the same time, it implies that the ability to hotspot is essential for student learning at university.

Likewise, more Commerce students created word-processed documents and presentations than the Humanities students in fulfilment of their respective LAAs. However, the above technical practices in both disciplines seem to be comparable, implying that technological knowledge and capabilities in connecting to the internet and using non-discipline specific ICTs and productivity software are essential for any student enrolled at university. Practical implications of these findings are that lecturers and tutors of first-year students survey students' computing experience prior to university in order to make more informed decisions about computer literacy classes or before preparing students for tasks that require computer literacy.

The nature of the LAAs within the two disciplines also influenced digital literacy practices in the techno-cognitive, cognitive, and cognitive and social-emotional dimensions. With respect to the techno-cognitive dimension, the LAA (as underpinned by the discipline digital literacies) influenced the type of online information students sought. Although students from both disciplines used Wikipedia to a lesser extent to search engines and YouTube, it has gained popularity in use by the first-year students. In terms of disciplines, more Commerce students than Humanities looked up definitions, concepts and examples on Wikipedia, while more Humanities students than Commerce students searched for scholarly articles on Google Scholar that helped them construct arguments. Commerce students and Humanities students also used business websites and accredited databases, such as JSTOR respectively. Additionally, more Commerce students than Humanities students produced images. Regarding the cognitive dimension, the discussion reveals that the nature of the LAAs determined the urgency for students to evaluate the quality of information. More Humanities students than Commerce students evaluated the quality of online information. Commerce students also, developed a site map for their e-business website. Furthermore, the Commerce students engaged in practices in the cognitive and social-emotional dimension where they collaborated on shared tasks, while Humanities students worked on individual tasks.

The above differences in student practices illuminate how students in the two disciplines used the same technologies to produce different texts (digital content) – the e-business concept document and essays. At the same time, the production of each of these texts involved a combination of discipline-related digital literacy practices that are in the cognitive dimension. From the above discussion, I conclude that students may be capacitated in common technical and socio-emotional practices, irrespective of their disciplines, but need to be socialised into the cognitive practices of their respective disciplines through the use of LAAs. This suggests that universities and lecturers should consider increasing student production of digital content and embedding discipline-related digital literacy practices that are in the cognitive dimension, into course curricula to enhance student acquisition of the associated skills and literacies.

7.3 Factors influencing students' digital-content creation

The discussion describes how student experience in using ICT (including prior experience and enrolment in a computing-related subject at high school, and ICT use for personal purposes), student volition, gender, historicity of university practices, course culture and student socio-cultural histories influence student digital content production.

7.3.1 Experience in using ICT

The discussion demonstrates that students had a tendency to transfer and adapt their digital literacy practices across the high school and university context, and between their personal and academic contexts. For instance, Commerce students transferred their high school experience in collaborating in, and sharing of, Google documents to their university practices; whereas students who were unfamiliar with digital collaboration practices were confronted with the inability to acknowledge others' input when collaborating on a shared task. As it has become clear that some students were collaborating online for the first time, I would recommend that, for any online collaborative activity, educators together with students draw up netiquette guidelines to guide the collaboration process. Additionally, those students who enrolled in computing-related subjects whilst in high school adapted other people's presentations and Google documents and collaboratively created word-processed documents, presentations, spreadsheets and Google documents at university.

Furthermore, students drew on their personal experience in using online resources, which they had accumulated over time, when they engaged in cognitive practices such as evaluating online information and in their techno-cognitive practices, such as curating digital resources within their formal courses at university. It was also impressive to note how students adapted their personal practices in social networks for their study-related purposes, such as establishing networks on LinkedIn, sharing and tweeting materials, and discussing learning activities via WhatsApp. They formed groups on WhatsApp as they did in high school. As Goode (2010b) noted, although there are currently no digital literacy requirements stipulated by universities, there is a subtle expectation for students to engage in digital literacy practices. This is evident in the current research study where students from both disciplines are expected to engage in digital literacy practices that are, at least, in the technical and cognitive dimensions. This was challenging as the discussion of this research has revealed that most student had prior experience in technical practices, but limited understanding of academic integrity, copyright and Creative Commons licencing, and experience in cognitive practices such as paraphrasing, in-text citation and drawing up a comprehensive reference or bibliography list. The above thus suggests that a comprehensive introduction to a digital literacy programme for first-year students, as well as authentic tasks for teaching digital literacies within disciplines, are important in an attempt to get those with no technical and information literacy experience on board.

7.3.2 Age

There were variations between the two age groups in terms of digital literacy practices. There were no differences between the two age groups in terms of technology device access, while younger students had better internet connectivity when compared to the older students. Younger students consumed more digital content – shared Google documents, used other people's spreadsheets without adapting them for own use and shared Wikipedia resources. On the contrary, more of the younger students than the older ones created podcasts and updated own blogs. However, these were very small percentages; 19% and 20% of the younger students created podcasts and their own blogs respectively.

Furthermore, more of the older students evaluated online resources for currency and objectivity when compared to the younger students. A more appropriate explanation for the evaluation practices seems to be linked to the older students' experience in personal use of online resources rather than age *per se*. The above suggests that lecturers and universities should not assume that all young students are digitally literate and are digital content producers. Even in the 21st century, universities need to consider means of improving first-year students' technology access needs, and digital content creation.

7.3.3 Student volitional actions

Students who were knowledgeable about hotspotting and had data used their 3G/4G sim cards to hotspot their mobile devices in order to engage in learning tasks when other free connections were not available. Furthermore, students made their own decision to participate or not participate in different social networks for learning purposes. Those who did so, establishing networks on LinkedIn, shared materials and discussed activities using WhatsApp, and microblogged study-related information. These practices were not part of the course requirements, but could be associated with students' prior experiences with, and personal use of, these technologies. Thus, the discussion suggests that to inculcate the culture of digital- content creation among students, lecturers could include relevant LAAs that are most likely to encourage a creation and participatory culture.

7.3.4 Gender

Access to technological devices and the internet was stratified by gender. In general, female students had better device access and more particularly, smartphones, when compared to male students. This also implied that female students had better internet access than male students, both on and off-campus. The findings of the current study are slightly contradictory to both international (Web Foundation, 2017) and South African (World Wide Worx, 2017) studies that reported that males have better internet connectivity than females. Additionally, the findings reveal that female students engaged with the internet and Wikipedia for learning activities more frequently than male students; these are of interest to other researchers as these findings contradict those of other studies conducted in Australia, the UK and USA. Also, more female students than male students curated their resources using Pinterest, implying that female students transferred their recreational practice to a learning context. The above suggests that male students in this study are at risk of not engaging in their learning activities when off-campus and misplacing (not curating) their learning resources when compared to female students.

7.3.5 Historicity of practice, course culture and student socio-cultural histories

Firstly, students from both disciplines relied solely on Google for searching online information because that is what most of them have been doing at high school. In the same vein, the discussion suggests a culture of ‘siloed’ student guidance (between library staff and academics) on information-search strategies and resources for academic writing. Lecturers from the two courses were more inclined to advise students on the resources to use for their LAAs. To overcome the ‘siloed’ student guidance, I would recommend that library staff in collaboration with lecturers offer faculty-focused research sessions for first-year students, on finding learning resources using the UCT library system, Google Scholar, standard internet-based searches and open educational resources (OER) repositories and directories. Related to information finding is student unawareness of resource licencing, more so of openly licensed resources. The discussion reveals that the course culture influenced how the two course lecturers guided students on resource licencing and prohibited use of Wikipedia in the Humanities course. Since students encounter openly licensed resources through standard internet searches, it is important to introduce first- year students to the concept of OER and alternative IP mechanisms, such as Creative Commons, during the library information sessions when students are being inducted to university, and within courses. I would also recommend that library staff and first-year student lecturers write explicit guidelines on how students could re-use OER that they encounter through their internet searches. At the same time, information about open licences and attribution should be treated with same level of importance as copyright and academic integrity within courses.

Secondly, students' academic writing histories impinged upon how students from both disciplines used and communicated information in their assignments. This qualifies the complexity of academic writing for first-year students, and at the same time, informs us that we cannot completely understand student practices at face value. I would recommend that first-year students be taught about IP and fair use, and attributing sources of information such as citing correctly and drawing up of comprehensive and accurate bibliographies or reference lists, as well as other academic writing practices, such as paraphrasing. Providing this kind of support may be overwhelming for the lecturers, but students could also work with the library and Writing Centre staff. For instance, some writing support resources have been provided in the Humanities course reader, but this may not be sufficient in supporting first-year students.

According to Engeström (1999b), transforming the old activity systems (which refers to digital literacy events in this research) may require a reflective analysis of the internal contradictions to inform the development of culturally advanced models, artefacts and practices. In the context of this research study, the findings suggest that HEIs need to reconceptualise learning and teaching structures and environments that foster digital-content creation. Institutional management may have to support such initiatives as there seems to be need for working relations between students, and academic, library and writing centre staff. At the operational level, LAAs have to be designed to teach students digital-content creation practices, and be thoroughly assessed. That is, students may be taught these practices by means of immersing students in such practices within their courses. This implies that students would be apprenticed into the academic and digital literacies of their courses and disciplines.

Engeström (2001) warns us that new systems take time to get transformed. However, if our HE systems take lengthy periods to transform, we may not catch up with knowledge production. So, universities require a deliberate strategy for collaboration between academics and the professional development unit on the integration of digital literacies for learning into the curriculum. There may also be implications for academic staff professional development. This need for professional development was highlighted already six years ago, by the Joint Information Systems Committee (JISC) where they call for professional development to:

> focus less on the adoption of specific new technologies and more on how meaningful tasks which explore authentic academic digital practices can be embedded in curriculum learning and how emerging digital practices might be usefully recontextualised in an academic setting (Payton, 2012:2).

The above demonstrates the complexity of the respective transformation process, but this is the direction HEIs need to consider.

7.4 Enabling and constraining factors for students' digital literacy practices

The discussion demonstrates that students' technology access at university is a constraining factor for their digital literacy practices. This student inequality in terms of device ownership at university seemed to be related to unaffordability of devices and/or connectivity by parents. In terms of practical application of these findings, lecturers and tutors of first-year students could survey students' access to technology when students first enrol at university in order to make more informed decisions about providing students with devices such as laptops or tablets. I would also recommend that university management considers cost-effective means for providing laptops or tablets to first-year students from families with a gross income between R350 000 and R600 000 per annum (or the missing middle category that is not eligible to receive the National Student Financial Aid Scheme) who do not have any personal mobile devices when they enrol to university.

Furthermore, staying on or off-campus created disparities among students in terms of internet access. I would therefore, recommend that students download and save learning resources on their devices while they are on campus. However, for web-based resources and activities, I would suggest that South African HEIs negotiate a standing arrangement with internet service providers, such as Vodacom, Cell C and MTN, to provide students a zero rating for all university-based learning materials to enable students to access learning materials off-campus. Also, students may visit public libraries to make use of the free internet quota as provided by the Smart Cape Access project. This uneven distribution of student access to internet connectivity outside university calls for a possible means of subsidising student internet connectivity outside the university.

The discussion also highlights how the availability of wifi connection at the university enabled informal communication, sharing of materials and discussion of learning activities amongst students but, at the same time, underpinned some tensions in formal university communication with students. I would recommend that HEIs train first-year students on how to set up their institutional mailbox on their smartphones or other mobile devices, at the beginning of the semester once they begin classes. They could also be trained on how to automatically forward e-mails sent to their institutional official accounts, to their personal ones. It is important to note that Tech Buddies at UCT train students on such aspects during the orientation period, but most students tend to be experiencing a lot of anxiety during this period as they are still settling in to university. This however, suggests a need for continued student support over the first semester when students are more settled and have figured out what academic and digital literacy practices are expected of them by their courses and the university. The discussion highlights the value of peer and social learning among students, implying that if communicating using HEIs' official e-mails is a conventional practice within courses and institutions, then students can develop the necessary digital literacies through social learning.

Moving from a critical realist perspective that seeks for explanations and an understanding of circumstances in specific contexts (Sayer, 2000; Maxwell, 2012), this research delved into the domain of the actual (that is, in events and experiences) to solicit some 'actual processes' (Maxwell, 2012) that led to students' digital literacy practices in their discipline-specific contexts. Maxwell acknowledges that critical realism (CR) holds that "reality is more complex than any belief or theory can fully capture [such that] multiple valid understandings of any phenomenon are possible" (2012:657). It is in this context that critical realists emphasise the 'causal role' of mechanisms underlying visible events and individuals' actions rather than 'causes'. Sayer argued that "[causal] explanation requires mainly interpretive and qualitative research to discover actors' reasoning and circumstances in specific contexts – not in abstraction from them" (2000:23).

In the current research study, the qualitative data of the mixed-methods approach used, together with AT were helpful in unpacking the factors that are discussed above, which were not directly perceptible. For instance, this research highlights how students (1) transferred their high school ICT experiences to their university digital literacy practices; (2) grappled with using OER because of their lack of understanding of licences alternative to full copyright; (3) of their own volition, established networks on LinkedIn, shared materials and discussed activities using WhatsApp, and microblogged study-related information. It is important to note that the identified factors are "situationally contingent; their actual context is inextricably part of the causal process" Maxwell (2012:36). For instance, students may only transfer their high school ICT experiences if the discipline-specific LAAs require such prior experiences. The above reveals that the students' digital literacy practices are influenced by a combination of factors (emergent properties), as illustrated in Figure 6.1. However, Bhaskar (2008) emphasised that, because real world situations operate as open systems, which are unstable by nature, emergent properties are more likely to change over time, even within the same context. In the context of the current research study, I am aware that there is need for: (1) an annual review of first-year students' prior digital literacy skills and practices, and (2) constant development of responsive curriculum, including adaptation of the LAAs. In turn, the open systems perspective suggests that the emergent properties may also change.

7.5 Contributions and limitations of the study

This research has contributed to the ideological conceptualisation of digital literacy as a social practice and, therefore, the nuances of digitally-saturated textual practices within different disciplines. As such, I further developed Ng' (2015) digital literacy conceptual framework. The empirical knowledge reveals that when students are required to fulfill learning and assessment activities (including individual or collaborative digital content creation) that are to be assessed and graded by educators, they acquire the essential digital skills and practices through social learning. The elaboration of Ng's (2015) framework has contributed to a better understanding of the role of the different disciplines in the acquisition of digital literacies among university students. The research findings could inform other HEIs in developing contexts on how to integrate digital literacies into course curricula as a means of building students' capacity on discipline-specific digital literacies. Furthermore, the research provides insight to how students could be developed to become digital-content producers, which potentially leads to knowledge production and, as such, suggests a way forward for HEIs in the global South. A limitation of this research study is that it is a small-scale study and, as a result, the research findings may not be generalisable. Also, it is quite likely that the more confident users of technology volunteered to participate in the focus grouped and interviews and therefore may have skewed the findings. Additionally, it would be interesting to investigate if similar results would be identified from case studies with students from the Faculties of Science, Engineering, Health or Law. Likewise, it would be valuable to better understand the influence on digital literacy in a larger study with a wider range of ages than the present study. However, the research findings are useful for HEIs and educators, because they illuminate that there are numerous socio-cultural factors that influence student digital literacies, that these stakeholders may need to pay attention to. Also, HEIs in South Africa and other developing contexts may get insight into how to improve digital technology mobile access to enable flexible learning.

7.6 Future research

The above demonstrates how intensive the work of integrating digital literacies into the curriculum is. The process is more complicated than academics simply integrating digital technologies into the curriculum with the intention of developing students' digital skills. A further research project that involves researching as many students as possible from across the different discipline areas in the university could yield a more comprehensive understanding on the role of generational and disciplinary factors in the development of digital literacies among university students. Furthermore, successful integration of digital literacies into the curriculum calls for the emergence of third spaces beyond the formal curriculum, where academics, library staff, writing centre staff and the professional development unit collaboratively work on this. Further research may have to be carried out on the effectiveness of these third spaces.

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Appendices

Appendix A: Questionnaire

Student digital literacy practices and adoption of open educational resources

You are invited to take part in a research project. This research is part of my PhD thesis. This research attempts to build a comprehensive understanding of 1) how students used technology and interacted with digital resources (digital literacy practices) before coming to university, and 2) how they are doing that now, at university. Technology includes any type of computer, Internet connectivity, mobile phone, etc. Digital or electronic resources generally include text, images, videos, blogs, website content, Wikipedia content, etc.

What does this research involve? Firstly, the researcher (Tabisa Mayisela) asks you to complete a questionnaire. Filling this questionnaire is voluntary and by filling it, you give me permission to access your responses and to consolidate the results generated from the responses. Please note that the questionnaire responses are anonymous. You are asked to enter your details at the end of this questionnaire only if you are willing to take part in the follow-up focus group discussions. However, even in this instance, I shall make sure that your identity is hidden at all times. These results will be used to improve how students could be supported in using technology and digital resources for their learning experiences.

* Required

Demographical data and background

1. **Gender** *
   Check all that apply.
   - [ ] Male
   - [ ] Female
   - [ ] Other

2. **Age** *
   Check all that apply.
   - [ ] <18 years
   - [ ] 19-22 years
   - [ ] 23-26
   - [ ] 27-30
   - [ ] >30

3. **What is/are your major courses?** *
   Check all that apply.
   - [ ] Politics
   - [ ] English
   - [ ] History
   - [ ] Other: ____________________

4. **Are you the first one in your immediate family to attend university?** *
   Mark only one oval.
   - ( ) Yes *Skip to question 6.*
   - ( ) No

If other family members attended university before,

5. **Who are the other members?**

____

____

____

____

____

Your use of technology before you came to university

6. **Did you have access to a computer, smartphone or the Internet while you were at high school? (Tick all that apply)** *

Mark only one oval per row.

	At home	At school	Both at home and school	None
Computer (any type)	◯	◯	◯	◯
Smartphone	◯	◯	◯	◯
Internet	◯	◯	◯	◯

7. **Did anyone at the primary home where you lived in, when you were at high school, use a computer?** *

Mark only one oval per row.

	Yes	No
At work	◯	◯
At home	◯	◯

8. **What age were you when you first used a computer?**

____

9. **What age were you when you first used a smartphone?**

____

10. **What learning activities did you use technology for, before coming to university? (Tick all that apply)** *

Check all that apply.

- [ ] Searched for information on the Internet for your studies
- [ ] Used the school library's electronic catalogue to find a book
- [ ] Submitted assignments by e-mail
- [ ] Shared files with your teachers and classmates using cloud-based storage (e.g. using Google drive, dropbox, etc.)
- [ ] Worked together with classmates on the same document or file (collaboration), when preparing your assignment or project
- [ ] I never used any technology for my learning activities
- [ ] Other: ______________________________

11. **What other activities did you use technology for, at your leisure time? (Tick all that apply)** *
Check all that apply.

- [ ] Accessed the school newsletter
- [ ] Shared files with friends using smartphone bluetooths or an equivalent
- [ ] Formed groups in chat technologies (e.g. WhatsApp) where you would share sms, images, videos, etc.
- [ ] Captured and cropped images using your mobile device (e.g. smartphone, tablet, Ipad)
- [ ] Captured and edited videos using your mobile device (e.g. smartphone, tablet, Ipad)
- [ ] Shared apps with friends using smartphones (e.g using WeShare)
- [ ] Other: ______________________

12. **For which computing subjects were you enrolled at high school? (Tick all that apply)** *
Check all that apply.

- [ ] Computer Applications Technology (CAT)
- [ ] Information computer technology (ICT)
- [ ] Programming
- [ ] A subject that taught website design
- [ ] A subject that taught video production
- [ ] None - I never enrolled for any computing related subject
- [ ] Other: ______________________

Your access to technology now

13. **This year, where do you access the Internet and what type of Internet connection do you usually have at the point of Internet access? (Tick all that apply)**
Mark only one oval per row.

	Broadband/ethernet/cable (high speed)	Narrowband/cable (slow speed)	Dial-up (modem)	Wi-fi (Hotspot)	3G/4G	Other	N/A
Home	◯	◯	◯	◯	◯	◯	◯
University	◯	◯	◯	◯	◯	◯	◯
Public library	◯	◯	◯	◯	◯	◯	◯
Internet cafe	◯	◯	◯	◯	◯	◯	◯
Cafeteria/restaurant/shopping mall	◯	◯	◯	◯	◯	◯	◯
At a family member's or friend's place	◯	◯	◯	◯	◯	◯	◯
Other	◯	◯	◯	◯	◯	◯	◯

14. **Who owns the technology you most frequently use to access the Internet? (Tick all that apply)**
Mark only one oval per row.

	Me	University	Public library	Internet cafe	Cafeteria/restaurant/shopping mall	Family member or friend	Other	N/A
Laptop computer	◯	◯	◯	◯	◯	◯	◯	◯
Desktop computer	◯	◯	◯	◯	◯	◯	◯	◯
Tablet	◯	◯	◯	◯	◯	◯	◯	◯
Mobile phone	◯	◯	◯	◯	◯	◯	◯	◯
Ipad	◯	◯	◯	◯	◯	◯	◯	◯
High or slow speed cable	◯	◯	◯	◯	◯	◯	◯	◯
Modem (Dial-up)	◯	◯	◯	◯	◯	◯	◯	◯
Wi-fi hotspot	◯	◯	◯	◯	◯	◯	◯	◯
3G/4G	◯	◯	◯	◯	◯	◯	◯	◯
Other	◯	◯	◯	◯	◯	◯	◯	◯

Digital literacy practices for studies and personal purposes

15. **Finding online resources relevant to your studies:** *
You use web tools such as ... for searching learning resources (Tick all that apply).
Check all that apply.

- [ ] Search engines (e.g. Google, Yahoo)
- [ ] Blogs
- [ ] Wikipedia
- [ ] YouTube
- [ ] Slideshare
- [ ] Google Scholar
- [ ] Social network (e.g. Twitter, Facebook, etc)
- [ ] iTunes
- [ ] Tedtalks
- [ ] Institutional open content repository (e.g. OpenUCT, MERLOT, MIT open courseware, Khan Academy)
- [ ] General OER directories (e.g. OER Commons, Open textbook library, OpenStax)
- [ ] Other: ____________

16. **Checking the appropriateness of online information (credibility of authors, currency, objectivity and reliability of information, etc.):** *

You check which online information is appropriate or inappropiate for your assignments or projects by considering:

Mark only one oval per row.

	Never	Rarely	Sometimes	Often	Always
Credibility of authors (who is the author, his/her other peer-reviewed publications, etc.)					
Currency (is the information current at the time of publication)					
Objectivity of information (does the source provide a balanced viewpoint of, or bias information)					
Reliability of information (are there any other sources that provide the same information)					

17. **Using social networking tools (e.g. Blogging using Blogger, WordPress, Tumblr), and frequency:** *

Which of the following activities do you do?

Mark only one oval per row.

	Never	Rarely	Sometimes	Often	Always
I have a blog, which I update as required					
I read other people's blogs					
I comment on other people's blogs					

18. **Using social bookmarking systems:** *

How do you keep a record of the resources you find online and/ or you may potentially want to share with others? Do you use?

Mark only one oval per row.

	Never	Rarely	Sometimes	Often	Always
Delicious					
Pininterest					
Diigo					
Evernote					
Other					

19. **Using social networking tools (e.g. Microblogging using Twitter), and frequency:** *
Which of the following activities do you do?
Mark only one oval per row.

	Never	Rarely	Sometimes	Often	Always
I follow people on Twitter					
I retweet information posted by others, on social matters					
I post a lot of information of social matters					
I retweet information related to my studies					
I post information related to my studies					

20. **Using social networking sites for studies** *
You have established a professional learning network (PLN) with experts and peers in your field of study, and or established personal networks, using :
Mark only one oval per row.

	For study purposes	For personal purposes	For both study and personal purposes	I don't have any networks on:
Facebook				
LinkedIn				
Google+				
MySpace				
Other				

21. **Managing a professional online profile** *
Which of the following do you do in your online networks?
Mark only one oval per row.

	Never	Rarely	Sometimes	Often	Always	N/A
I think about my personal reputation when I say or do anything online						
I manage the privacy settings of my social networking sites, carefully						
I make sure that whatever I post is suitable for my different networks e.g. personal, my learning group, etc.						
I regularly google my name to see what is on the Internet about me						
I act positively against cyber-bullying						
I act positively against other reputation damaging online behaviours						

22. **Using instant messaging or chat technologies (such as MSN, Yahoo messenger, WhatsApp; etc.):** *

You use instant messaging or chat technologies for personal and/or study communication purposes
Mark only one oval per row.

	For study communication purposes	For personal communication purposes	For both study and personal communication purposes	N/A
MSN messenger	◯	◯	◯	◯
Yahoo messenger	◯	◯	◯	◯
WhatsApp	◯	◯	◯	◯
WeChat	◯	◯	◯	◯

23. **Below are examples of digital resources and potential student practices. For each of the resources, tick all that is applicable to you. Answer all rows** *

Mark only one oval per row.

	I have created my own	I have shared my own (original) copy	I tag my original copy	I collaboratively created content with my peers	Used others' ('as is') copy	I tag others' copy	Revised/adapted others' copies for my own use	Redistributed others' copies (adapted others'copies and shared with my peers)	N/A
Word document or equivalent	◯	◯	◯	◯	◯	◯	◯	◯	◯
Excel spreadsheet or equivalent	◯	◯	◯	◯	◯	◯	◯	◯	◯
Powerpoint presentation or equivalent	◯	◯	◯	◯	◯	◯	◯	◯	◯
Google document or equivalent	◯	◯	◯	◯	◯	◯	◯	◯	◯
Audio podcasts	◯	◯	◯	◯	◯	◯	◯	◯	◯
Images (using Flickr, Instagram, etc.)	◯	◯	◯	◯	◯	◯	◯	◯	◯
Videos (using YouTube, Vimeo, etc.)	◯	◯	◯	◯	◯	◯	◯	◯	◯
Screencasts (using Camtasia, Captivate, etc.)	◯	◯	◯	◯	◯	◯	◯	◯	◯
Websites	◯	◯	◯	◯	◯	◯	◯	◯	◯
MediaWiki (e.g. Wikipedia)	◯	◯	◯	◯	◯	◯	◯	◯	◯

24. **For what purposes do you create or use the above digital resources? Answer all rows.** *
Mark only one oval per row.

	Study purposes	Personal purposes	Both study and personal purposes	Other	N/A
Word document or equivalent					
Excel spreadsheet or equivalent					
Powerpoint presentation or equivalent					
Google documents or equivalent					
Audio podcasts					
Images (using Flickr, etc.)					
Videos (using YouTube, Vimeo, etc.)					
Screencasts (using Camtasia, Captivate, etc.)					
Websites					
MediaWiki (e.g. Wikipedia)					

Adoption (use and reuse) of OER:

Open educational resources (OER)are teaching and learning resources that are openly licensed (e.g. under Creative Commons licenses) and can be used and/or adapted by others.

25. **What type of resources do you think open educational resources (OER) include? (Tick all that apply)** *
Check all that apply.

- [ ] I don't know what OER are
- [ ] OER are any resources found on the Internet
- [ ] All articles found in Google scholar are OER
- [ ] e-books are OER
- [ ] Any Youtube video is an OER
- [ ] Any image shared online is an OER
- [ ] Wikipedia are OER
- [ ] Web 2.0 developed resources are OER
- [ ] Other: ____________________

26. **Can you remember the source where you first heard about the concept of OER?** *
Check all that apply.

- [ ] Orientation/induction
- [ ] Tutorial session
- [ ] Peers
- [ ] Library information
- [ ] Course website/LMS
- [ ] Web searches
- [ ] This is the first time I am hearing of it
- [ ] Other: ____________________

27. **To your knowledge, have any of your lecturers ever used OER in their teaching materials for your courses?** *
Mark only one oval.

- ◯ Yes
- ◯ No *Skip to question 30.*
- ◯ I am not sure *Skip to question 30.*

Lecturer/s have used OER in course(s)

28. **If an OER was used in your course(s), how did you learn that it was an OER?** *

____

29. **Please specify the name of the course**

____
____
____
____
____

30. **How long have you been aware of intellectual property mechanisms (e.g. Creative Commons, GNU GPL) licensing, alternative to copyright?** *
Check all that apply.

- [ ] I have never been aware of any alternative intellectual property mechanisms
- [ ] 1-3 months
- [ ] A semester
- [ ] More than a year
- [ ] As far back as high school
- [ ] Other: _______________________

31. **Can you remember whether any of the digital resources you created, adapted or redistributed were OER or not?** *
Mark only one oval per row.

	Some were OER	None were OER	I am not sure	N/A
Word document or equivalent	◯	◯	◯	◯
Excel spreadsheet or equivalent	◯	◯	◯	◯
Powerpoint presentation or equivalent	◯	◯	◯	◯
Audio podcasts	◯	◯	◯	◯
Images (using Flickr, etc.)	◯	◯	◯	◯
Videos (using YouTube, Vimeo, etc.)	◯	◯	◯	◯
Screencasts (using Camtasia, Captivate, etc.)	◯	◯	◯	◯
Websites	◯	◯	◯	◯

Thank-you for your time. Would you be available to spare me 30 minutes of your time for a focus group discussion during the first or second week of May 2016?

32. *Mark only one oval.*

- ⬭ Yes
- ⬭ No *Stop filling out this form.*

Your details

33. **Please provide your name and surname** *

____
____
____
____
____

34. **Please provide your e-mail address** *

____

35. **Please provide your phone number (optional)**

____

Appendix B: Focus group question guide and Interview schedule

Digital literacy practices

1. How did you find resources online (Which web tools do you use for searching learning resources)?

   Hint: Search engines, SlideShare, YouTube, blogs, OER directories, Institutional open content repositories
2. Please give examples of resources you used for accomplishing the class tasks (WordPress tasks).
3. What did you look out for regarding the quality of the resources you found?

   Hint: credibility of authors, currency, objectivity and reliability of information, etc.
4. Which technological tool(s) did you use to work on the class tasks? (Please name them and explain how you used each of them.)
5. What motivated you to use these particular technological tools?
6. How did you learn to conduct each of the above practices?

Adoption of OER

Open licensing through Creative Commons is one of the ways in which OER are identified and shared.

7. How did you set about finding OER for your project (e.g. CC licensed images, videos, simulations, etc.)?
8. Please give examples of OER that you used for your project.
9. (a) If student has used some OER - What motivated you to use OER for your tasks? OR

   (b) If student has not used any OER - Why didn't you use OER for your tasks?

   Hint: Inability to identify OER among other online resources; In-ability to find existing OER on topics for my studies; etc.
10. In what ways did you adapt or modify any of these OER that you used?
11. (a) If student has adapted or remixed OER - Why did you adapt the resources?

    OR

    (b) If student has not adapted or remixed OER – Why didn't you adapt the resources?

    Hint: Lack of understanding of Intellectual Property licenses, Copyrights and Creative Commons licenses; In-ability to find existing OER on topics for my studies; Not knowing whether I have permission to adapt the resources I found; Inadequate bandwidth; Poor technical skills
12. How did you share the OER (electronic or hardcopies) that you found, with other students?
13. What value did you get out of using OER, for the tasks in particular and for learning in general?

Thanks for your time

Appendix C: Examples of student assignments

Commerce course: E-business project

Question 1: Provide a brief description of your business and identify at least 3 products you will be selling under category 2. Come up with a relevant business name.

The business is about selling and buying skin-care products for all genders as well as all age groups with e-commerce being our main form of operation. The target market for the business is mainly the UCT students at large but as a business we decided to cater for everyone, meaning other customers can also be able to buy products that can help their loved ones. The name of our business is called Jamilla which means beautiful in Arabic. The reason we decided on this name is because each and everyone wants to be their most beautiful and confident self, but with heavy workloads and deadlines to meet, the majority of UCT students do not have the time and energy to give their skin the care and attention it needs. Therefore, as a business we are helping students to balance beauty and brains. We provide a range of products from basic skin-care products to intense products like fragrances, special facial products (soaps, masks, cleansers, toners and creams) and make-up. The business's category of transaction is strictly Bricks & Clicks.

Question 2: What type of e-business did you identify? Why do you classify it as such?

Our e-business type is a business to consumer business (B2C) and this is because this will be an interaction between our business and our consumers, which is to say that we will be providing beauty products and optional consultation to our customers.

Question 3: Discuss with your group members and decide on who your suppliers are. Identify at least 3 suppliers.

- Revlon
- Nivea
- Justine

Briefly discuss your business processes – Provide 2 examples of your business activities; explain how Information systems will support processes and functions along the supply chain

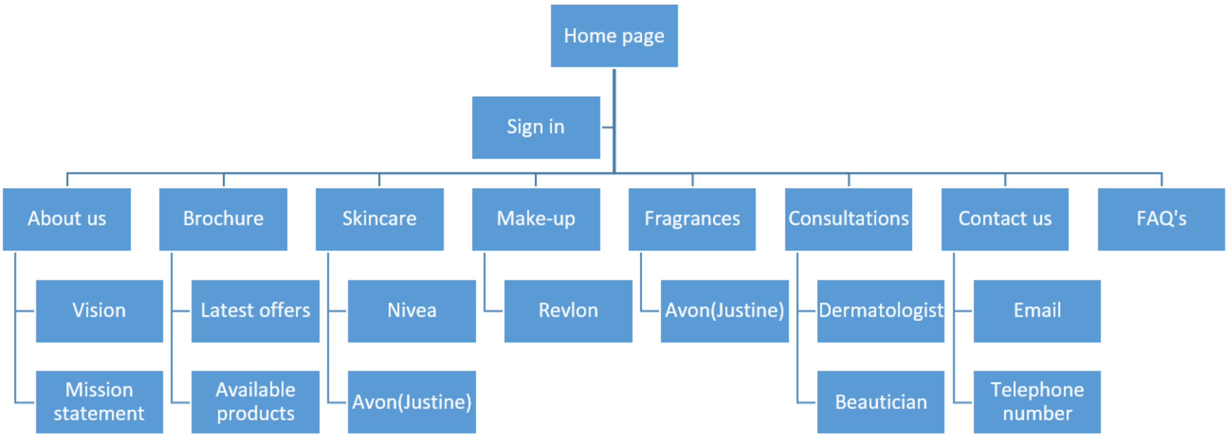
Information flow - Jamilla will use information of customers for the benefit of both parties (the business and the consumers). The sign-up tab in the website will be used by the customers to enter their details in order for their accounts to be activated. A customer will be asked to enter personal details like a customer's name & surname, ID number, phone number, email address and physical address of the customer. The name & surname will be used by the business for addressing the customers in a proper manner. ID numbers will inform the business about the customer's age, so that proper skin care product may be recommended by our beautician, because the skin elasticity changes as a person gets older. The phone number and email address will be used to inform the customers about the business new range of products, discounts offered, etc. Since people tend to give false information for various illegal reasons, the business will send a code to the customer's email address/phone number. The customer will be required to enter that code in the space provided during the account activation process. This will inform the business about the verification of that information. The physical address will be used for the direction to the customer's res, home or anywhere the customer lives, when a request was made for the product to be delivered personally to the customer.

Financial flow- The manner in which information systems will support the upstream and internal components, as well as the downstream component, will be discussed. Jamilla will purchase beauty products from the above- mentioned suppliers at a wholesale price, which will take place using an electronic funds transfer. Thereafter, the stock will be delivered to our premises in Cape Town. With regards to the downstream component, customers will be prompted to sign in using their UCT sign in details since our prime target is UCT students, then the customer will be redirected to our product prices (which will be shown at a selling price of 50% mark-up on cost).The customer will then have the option of selecting the products they desire by placing it in a trolley. They will then be given three payment options, either by credit card, EFT payment or cash on delivery. Cash on delivery has been included as a payment option to cater for those students who do not possess credit cards or have immediate access to the internet to process payments. If the credit card option is chosen, they will be prompted to enter their credit card number. If the EFT option is chosen, they will have to choose their bank and then plug in the necessary details in order to process the payment.

Product/service flow- Products will be transferred from the business to consumers in a variety of different ways. There will be a number of students on campus working as agents. These agents will act as intermediaries between the business and consumers. Products will be able to be collected from these agents at campus and payment for the products can be received by them as well. The business will also make use of a door to door delivery system, where products can be directly delivered to students' residences, homes, etc. Furthermore, students will be able to collect the products they have ordered online directly from the business headquarters. With regards to consultations, a question and answer tab will be available on the site. These questions will then be forwarded to a professional and in the case of more advanced questions, it will be referred to dermatologists. Consultations with agents will also be possible.

Information systems will assist the above processes in the following ways: Emailing and sms'ing will be used as platforms to provide details of meetings for consultations (e.g. time, place etc.) as well as details of meetings with agents in which students can collect their products on campus. Also, emails or sms's will be used to send reminders to clients about when their products will be arriving, and where they should collect them. Furthermore, with regards to consultations, the online question and answer tab will be used as the main platform. Questions that are frequently asked will then be captured and placed on a "frequently asked questions" tab so that consumers will be able to gain answers in a more efficient manner.

Question 4: Brainstorm on the content of your website by creating a site map for your online store [website]. You are required to have a minimum of 3 pages for your online store



Website structure

Homepage

This is the landing page of the website. It will display various tabs that make certain information for certain customers easily accessible. The homepage will display various tabs, such as: Login, About us, Brochure, Contact us, etc. These tabs are explained in detail below. Current products on special will be displayed on this page to attract the customer and influence them to continue looking through various tabs of the website. The main aim of the homepage is to give the user a basic understanding of what the business is selling and any new developments or products we have at that point in time.

Login

Due to past transactions, a customer who has previously made use of our services will have their data captured in the system and he/she will be prompted to enter their account details to access their account.

Shopping bag (Cart): Lists the items the consumer plans to purchase and pay for upon checking out.

Wish list: Lists the items that the consumer wishes to purchase in the future, but cannot purchase them presently due to budget constraints, etc. and puts them in a place where they are ready to be purchased when the consumer is able to buy them.

Past transactions: This will show the products they have purchased in the past.

Account balance: How much they are owing at that point.

About us

Information about the business will be available on this tab of the website. This will include information that is not only necessary for customers only, but potential investors as well.

What we offer: We offer a wide range of products which we have specifically identified as being essential to students. The business sells Nivea, Avon and Revlon products. The business will also have beauticians and dermatologists to help students with identifying which products would be perfect for their skin.

History: A group of 6 students attending the University of Cape Town had discovered the need for a beauty store on campus. Students show a lack of knowledge on how to take care of their physical appearance and so in 2016 we had decided to establish Jamilla. We are aware of what students need and want: to be the most beautiful and confident versions of themselves. This is what Jamilla strives to do: create an environment of confident students, who look and feel their best, without all the hassle.

Mission statement: Jamilla's main objective is to ensure we are accessible to all University of Cape Town (UCT) students. We have recognised the market for beauty products which will assist students to take care of themselves. Our store will ensure we not only sell products but also establish an interactive platform to assist students with any issues they have regarding their skin.

Vision: We aspire to be more than just a store selling beauty products. Jamilla recognises the importance in taking care of your well-being while also establishing your path to making a difference in this world. We want students to not only strive in receiving the best academic results but also feel and look good whilst doing it. After all, your wellbeing is our first priority.

Brochure

Various goods available on offer will be displayed on this page. The different brands we sell will be listed with the different products under each brand together with their prices.

Contact us

Information regarding how the customer can be in contact with our business will be displayed on this tab of the website.

Address: 4.13 Level 4, Steve Biko Building, University of Cape Town. P.O BOX 6788

Telephone: 021 605 3344

Email: jamillabeauty@gmail.com

Operating hours: 24 hours a day.

#KeepInTouch: Because of the modern world we live in and the importance of social media, Jamila has decided to engage with its customers via social media to regularly keep them updated on the latest happenings, products and sales in the business. We are available on:

Facebook: Jamilla Beauty Products

Twitter: @jamillabeauty

Instagram: @jamillabeauty

Consultations

However, what happens when your question is not a frequently asked question and it does not make it to the FAQ page? We have all that in order. Our website has a professional dermatologist and a professional beautician listed under the consultation tab. This is a space that helps you seek professional advice on the right goods for you and offers various advice to issues relating to make-up, skincare and fragrances.

Frequently Asked Questions (FAQ's)

As a customer, you sometimes have questions that you would like answers to. At most times, you find that you are not the only one that has that specific question. On this tab, we provide answers to questions that customers usually bring forward. These are answers to common questions amongst customers. An example of FAQ's would be: "How long does it take for my orders to be delivered to me from the date of order?"

Skin Care

On this page a list of available skin care products available for sale will be listed and categorised under their product names. The prices will also be available for each product.

Make-up

On this page a list of available make-up products available for sale will be listed and categorised under their product names. The prices will also be available for each product.

Humanities course: Essay

Gender

The media have always won in constructing gendered identities in our everyday lives and the struggle is not near the end – it also won in reinforcing gendered notions of womanhood and that is more and more popular through the media as time moves. However, the traditional notion of women has changed since the 1930's and they are continuing to change in the present day, Gantlet (2008:5) states that "that this is a change in attitude. The reality of actual behavior is somewhat different". This essay will argue that the media reinforces socially constructed gendered identities through the depiction of gender roles in television and print advertisement (Waters and Ellis, 1996:94). To prove this argument this essay will do a detailed analysis of two adverts, one is the image of a Pep Advert and the other image is an advert by Anglo-American.

This essay will also reflect on identity, culture, gender, socialization, stereotypes, boundaries and practices. Before that it is imperative here to define socialization which is the process of teaching and learning well defined patterns of living within a society, people use this knowledge to identify themselves and identify others (Makhubalo2007:26) so therefore we can conclude that the media is an agent of socialization because it promotes socially constructed gender identities of woman in society, people use media to make sense of their surroundings to make sense of what is happening around the world more specially it is through the media that woman are grouped into different gender roles.

The pep advert delineates two images of a white young couple, the other image this couple is standing with the woman standing in front of the man and the other show the man holding the woman's waist, they both in what seem like a kitchen well there is a bold print that appear as a thought bubble next to the man that reads "so the harder a wife works, the cuter she looks". She has a smile on her face while she holds the cleaning dust with both of her hands. The advert was created in the 1930's which was the time of the largest social stock market crash in American history most of the decade was consumed by an economic downfall called the great depression that had a traumatic effect worldwide, leading to wide spread unemployment and poverty. So, I assume this will suggest that women stayed at home while men went to work because there was unemployment and poverty. The caption "so the harder a wife works the cuter she looks" suggests somehow that a woman who works hard by doing all the house chores like cooking for the men and cleaning the house is more sexier and cute than a woman who try and compete with men in the work place in a men's world and somehow this again sends a message that her ability, skills and more importantly her brains are measured by how well she does the house chores rather than how she is able to do them and most importantly she shows off her feminist as a woman, Gauntlet (2008:11) states that "feminity, on the other hand is not necessarily seen as the state of being a woman, instead its perceived more as a stereotype of a woman's role from the pat" he further states that "feminity is not typically a core value for women today, instead being feminine is just one of the performances that women can choose to employ in everyday life-perhaps for pleasure or to achieve a particular goal" so this again come to the point which I raised earlier of how gender identities are socially constructed this emphasize that society reinforces hope woman should appear or represent themselves in society, it reinforces such stereotypes, feminity is not something that woman must employ because they females just like culture is about boundaries that are learnt and unlearnt (Thornton, 1998:21) which will mean that feminity is also used as an agent of socialization in society amongst women.

The same advert again displays woman as the weak or unable species, if we alternatively understand the two texts written in the box on the image these two texts convey a message to the reader that in order for women to be at their utmost best in what they do they must have something to support them which in this case vitamins. Gender identity is the extent to which one identifies as being either masculine or feminine (Diamond 2002) not necessarily that women must be feminine because they women, well the boundary between masculine and feminine is being reinforced through cultural resources and different people have access to those boundaries or to these resources, they have unequal access t them and that makes a difference. Gender identity is also being constructed through unequal access to cultural resources but if people got more access to cultural resources they can unlearn them.

The third image is an advert by Anglo-American, a South African mining company. This advert displays a woman who is wearing a hamlet which could represent the working class, but it could also make a statement in the context of the advert that she is a female mine worker. She is wearing a red lipstick and have a smile on her face and gain the smile could say that she is happy about her job she loves her work but the lipstick could convey a message that even though I'm not just any mine worker but a female mine worker so I must look sexy and attractive to my fellow human, there is a caption on top of the advert that is written "the best man for the job" well this tittle suggests that in order for her to master the job she must employ masculinity so she could be in a man's world and this is something similar to the first image that in order for woman to do certain things that according to society are made for man must change themselves however that's but then gain this caption might send a message that she must employ notions of masculinity so she could be able to do the job but we must also consider that a smile is associated with women. It is written in text on the advert "at Kumba iron ore, we believe every South African deserves to be recognized for their hard work and unique talent……" but yet according to the caption "the best man for the job" it seems not to recognize women for their hard work and unique talent because it compares women with men ironically by saying the best man for the job why not the best woman for the job? This clearly prove how society reinforce gender roles, well gender roles refer to the society's concept of how men and women are expected to act and how they should behave (William: 2013,120) however Anglo-American do support equality as their logo says “Real mining. Real difference” which will suggest that both man and women are treated equal in the work place furthermore even though this image contradicts the notions of women being domestic goddess like doing domestic work, but it still says they must change themselves and that is sexism (pg. 122)

To conclude I want to state that according to Gorge Murdock's classic work outline of world cultures (1954), all societies classify work by gender, meaning that a man's job is still considered more important that a woman's job. Both these adverts have shown a great movement to show how traditional notions of womanhood have been transformed, the national center for social research (2002 cited in Gauntlett 2008:4) states that “the traditional view of women as dedicated “housewives” seems to be all but extinct only around one in six women and in five men think women should remain at home while man go to work. Therefore, indeed gender is socially constructed through socialization so therefore the socially constructed representations of women have changed over the past and in tradition for that matter and upon all that the way the world view women is the present day has changed too.

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Permanent link: http:/en.wikipedia.org/w/in-depth? tittle=1930’s&oldid=717097452
Revision history statistics: 717097452

Appendix D: NVivo codes derived from student focus groups and interviews

Nodes

Name
Adoption of OER
AT triads
Cognitive dimension
Concerned about referencing
Constraining factors
Cost implications
Digital literacy practices
Digital literacy practices at high school
Family member with technology experience
Google is more accessible than Wikipedia
Habitus
Identity
Influence of another course
Learning
NVivo1
Online learning resources
Open practices
Social practice
Socio-emotional issues
Use of Gmail over UCT mail
Use of information for re-assurance of one's knowledge
Use of media technologies
Use of social networking sites
Used WhatsApp for personal_family purposes
Used WhatsApp for study and personal_residence purposes
Using social networking tools
Whether or not a 1st generation univ. student
Why students don't contribute to WhatsApp and Facebook
Writing practices

Appendix E: Information sheet

Dear Student

Thank you for verbally agreeing to participate in this research project aimed at investigating first-year higher education students' digital literacy practices. In order to achieve the aims of the research, I intend to investigate first year higher education students' digital literacy practices prior registering at the University of Cape Town, during their learning process (inside and outside teaching spaces), and any other related practices. I would also like to understand how you acquire the digital literacy practices you implement when learning in your courses.

The data collection methods in this research include a questionnaire, focus groups and artefacts. Data will be collected over a semester. The process of data collection will be in phases:

Phase 1: Students' digital literacy practices (prior university and the 1st few weeks of classes) will be elicited through a questionnaire

Phase 2: Focus groups will be conducted in May

Phase 3: Artefacts of digital content created by students (in the form of assignments) will be analysed

When reporting in the research outputs (thesis, academic papers, etc.), I shall not be using any of the participants' names; I shall endeavour to protect your identities. Pseudonyms will be assigned to participants and any potential identifiers, to maintain anonymity. If I think someone may be able to identify a participant and that such identification could in any way have negative consequences for the individual, I will send the individual the relevant sections of the report and I undertake to make changes to the satisfaction of the individual concerned. I shall maintain data confidentiality at all times and also the Head of Department and course lecturer will not have access to this data.

Please note that:

1. Participation in this research is voluntary and you may withdraw from the research at any stage.

2. By taking part in the research, you affirm that you are at least 18 years old and that you give your consent to use your responses in this research.

3. In all use of the data that is gathered, you will remain anonymous.

4. If you require any additional information concerning this project, please do not hesitate to mention it at any stage during the research. My contact details are as follow:

   Ms T Mayisela
   Work: 021 6501774/Cell no. 0798780727
   E-mail: tabisa.mayisela@uct.ac.za

I thank you, in anticipation, for your time.

Appendix F: Consent form for completion of student questionnaire

Dear Participant

Thank you for verbally agreeing to participate in this research project aimed at investigating how and why might first-year higher education students acquire digital content creation literacies. The purpose of this document is to obtain your written consent for participating in this research study by responding to this questionnaire.

Signed agreement between researcher and participant

I, Thabisa Mayisela (the researcher) do hereby swear that all data obtained from the survey will be treated with confidentiality, and the anonymity of the research participant will be maintained.

Signed:____Date:___________________

I, …………………………………………………… (research participant) do hereby acknowledge that I have been informed of the purpose, method and envisaged benefits of this research and have given my informed consent to participating in the survey provided that confidentiality of my responses is observed. I give permission to the researcher, for the data generated as a result of this survey, to be used with my identity hidden.

Signed: _______________________ Date:___________________

Appendix G: Consent form for audio-taping the focus group discussion/Interviews

Thank you for your verbal agreement to participate in this research project. The purpose of this document is to obtain your written consent for recording your discussion with me. In order to capture our full discussion, it will be helpful for me to audio-tape all proceedings. Only you and I shall have access to the recorded data. The recordings will be destroyed after a year of completing the research.

Signed agreement between researcher and participant

I, Thabisa Mayisela (the researcher) do hereby declare that all information obtained from the audio-tapes will be treated with confidentiality, and anonymity of the provider of the information will be maintained.

Signed:____Date:__________________

I, …………………………………………………… (research participant) do hereby acknowledge that I have been informed of the purpose of the audio-tape and how the data will be protected. I have given my informed consent to being audio-taped during the discussion provided that confidentiality of my contribution is observed. I give permission for the data generated as a result of this research, to be used with my identity hidden.

Signed: ____Date:__________________

Appendix H: Consent form for accessing digital content artefacts

The purpose of this document is to obtain your written consent for accessing your digital content artefacts (submitted assignments).

Signed agreement between researcher and participant

I, Thabisa Mayisela (the researcher) do hereby declare that all information obtained from the artefacts will be treated with confidentiality, and anonymity of the provider of the information will be maintained.

Signed:____Date:___________________

I, …………………………………………………… (research participant) do hereby acknowledge that I have been informed of the purpose for accessing my submitted assignments and how the data will be protected. I have given my informed consent provided that confidentiality of my data is observed. I give permission for the data generated as a result of this research, to be used with my identity hidden.

Signed: ____Date:___________________

Appendix I: Student access and use of technological devices whilst at high school

Table 1: Students without any technology device access whilst at high school

	Computer access	**smartphone access**
1.	None	None
2.	No response	No response
3.	None	None
4.	None	None
5.	None	None
6.	None	None
7.	None	None
8.	None	None

Table 2: Student without either device or Internet connectivity while at high school

	Computer access	**Smartphone access**	**Internet access**
1.	At school	At home	No response
2.	Both at home and school	Both at home and school	No response
3.	None	At school	None
4.	**None**	**None**	**None**
5.	No response	No response	No response
6.	None	At home	None
7.	No response	At home	No response
8.	At school	At home	None
9.	At home	At home	None
10.	At school	At school	None
11.	None	At home	No response
12.	At home	At home	No response
13.	**None**	**None**	**None**
14.	No response	At home	No response
15.	No response	Both at home and school	No response
16.	At home	At home	No response

Appendix J: Students' digital literacy practices while studying at university

Table 1: Owner of device used by students

Owner of device	Smartphone	Desktop	Laptop	Tablet	iPad
Me	84	6	42	42	12
University	3	50	11	10	3
Me; University	0	4	1	0	0
Family member or friend	2	2	8	11	5
Me; Family member or friend	0	0	3	0	0
University; Family member or friend	0	1	2	0	0
Internet cafe	0	0	1	0	0
University; Internet cafe	0	1	0	0	0
University; Internet cafe; Family member or friend	0	1	0	0	0
Public library	0	0	1	0	0
University; Public library	0	5	1	0	0
Public library; Internet cafe	0	0	0	1	0
Public library; Family member or friend	0	0	1	0	0
University; Public library; Family member or friend	0	1	0	0	0
University; Public library; Internet cafe	0	1	1	0	0
University; Public library; Internet cafe; Family member or friend	0	2	0	0	0
Me; University; Public library; Cafeteria/restaurant/shopping mall	0	0	1	0	0
Other	0	0	0	1	0
Grand Total	89	74	73	65	20

Table 2: Student gender and access to 3G/4G connectivity while studying at university

Row Labels	Student owns 3G/4G	
Female		
Family member or friend	1	
Me	31	50%
N/A	10	
No response	19	
University	1	
Female Total	**62**	
Male		
Me	14	34%
N/A	17	
No response	8	
Other	1	
University	1	
Male Total	**41**	
Grand Total	**103**	

Cognitive dimension - Evaluation of resources

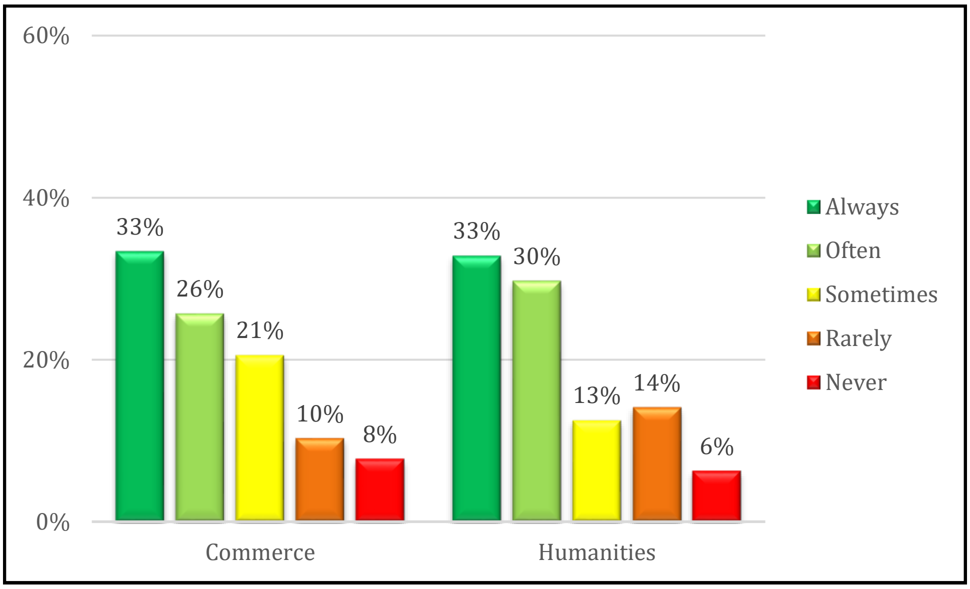

Figure 1: Discipline distribution and frequency of checking reliability of information

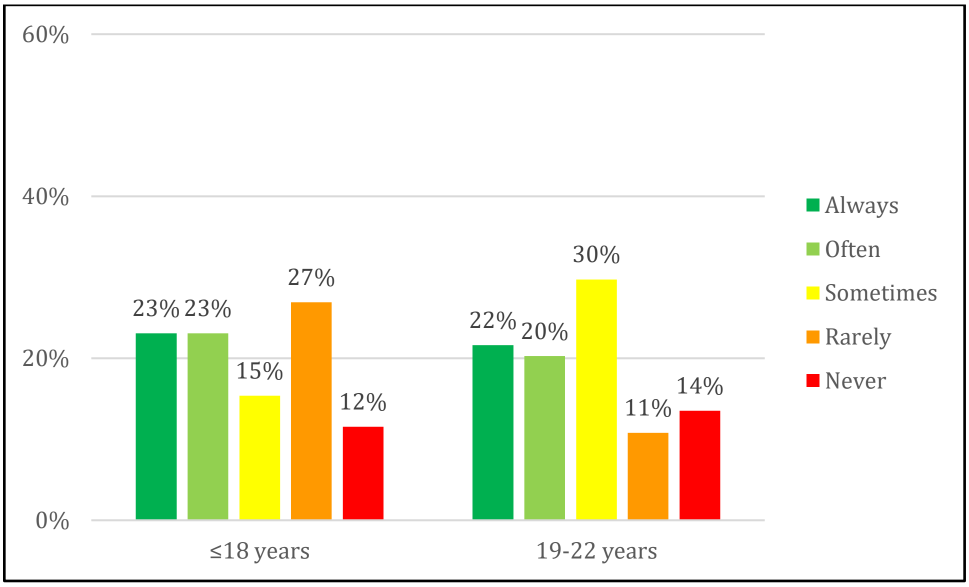

Figure 2: Age distribution and frequency of checking credibility of authors

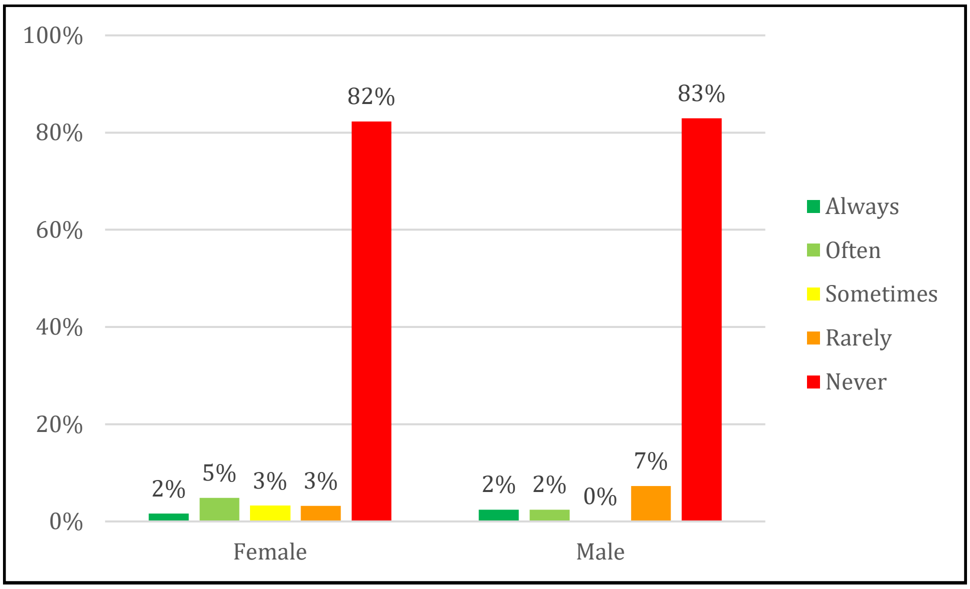

Figure 3: Gender and updating own blogs

Appendix K: Students' awareness of Creative Commons licenses and open educational resources

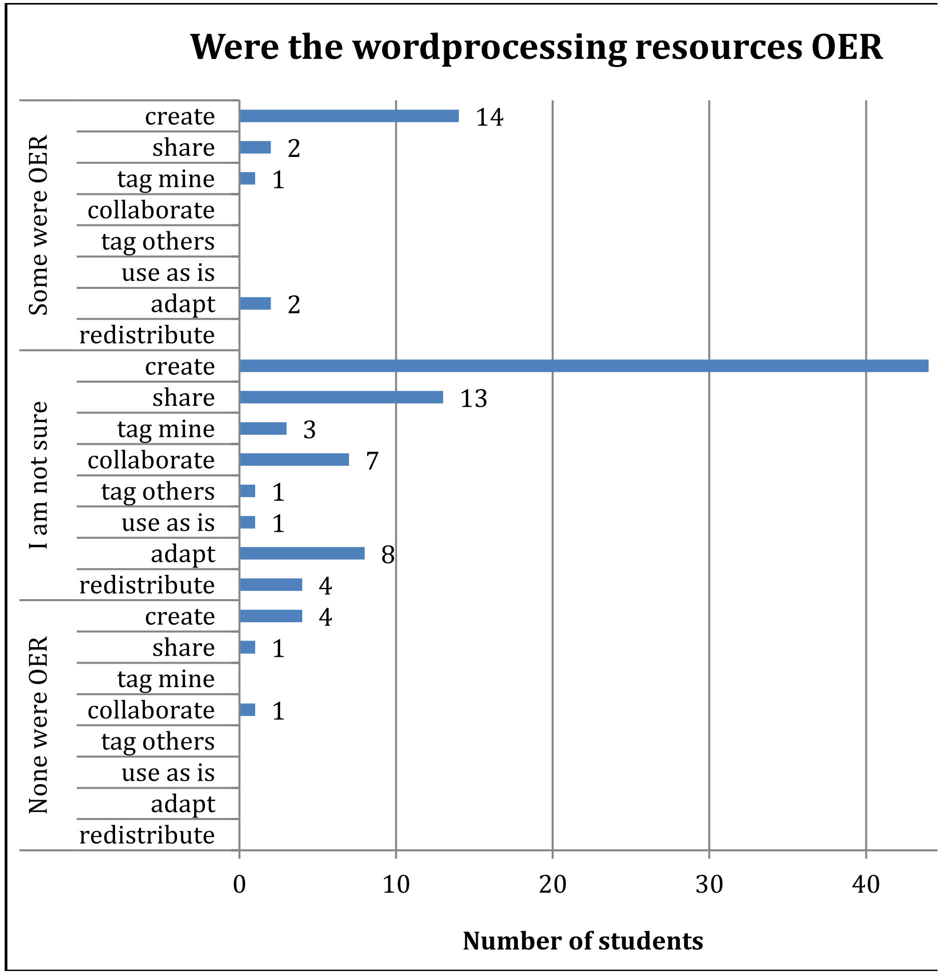

Figure 1: Word processing resources used by students

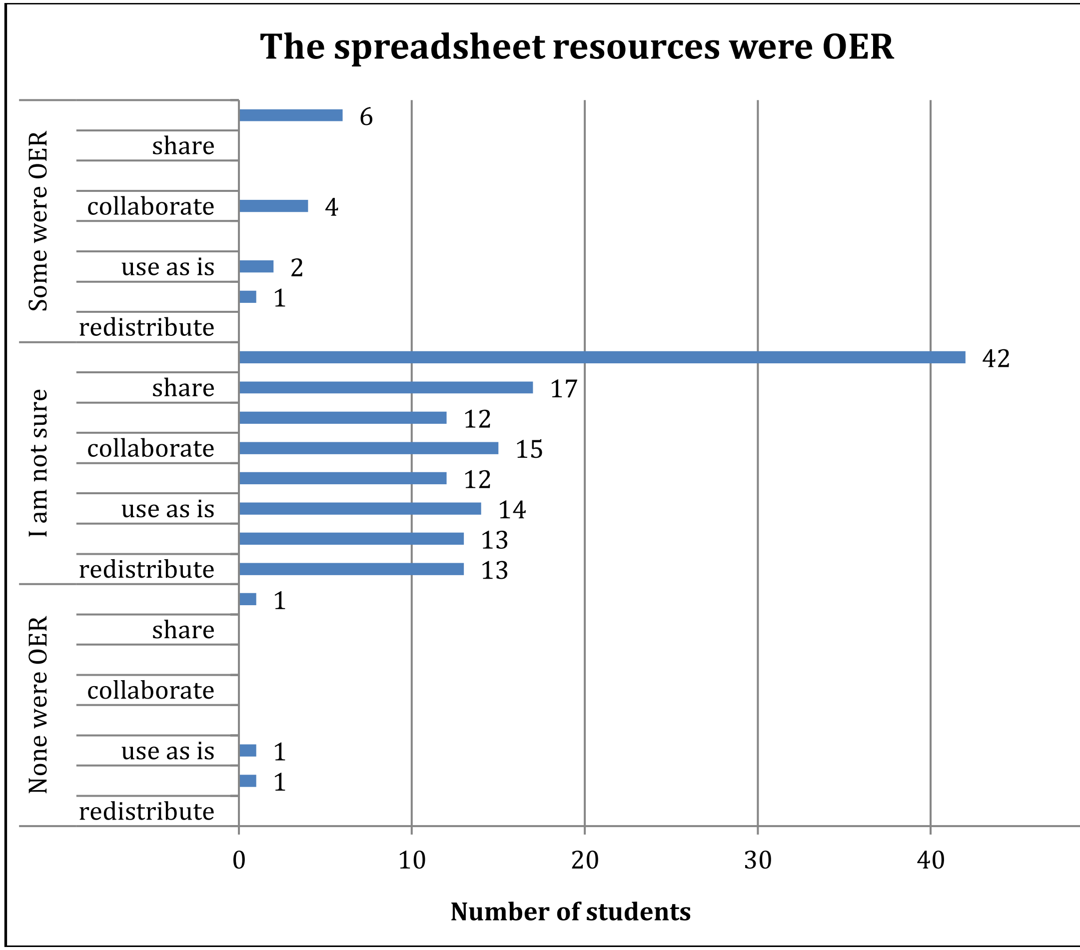

Figure 2: Spreadsheet resources used by students

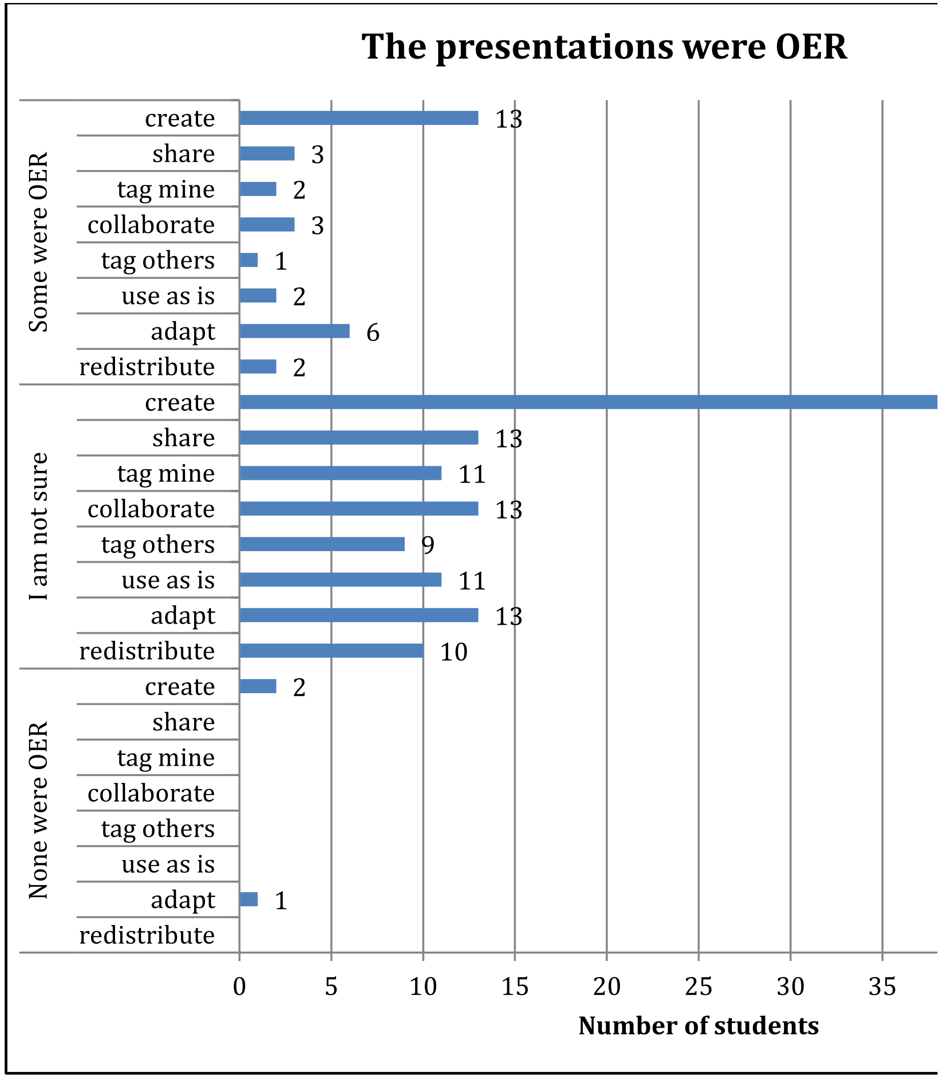

Figure 3: Presentations used by students

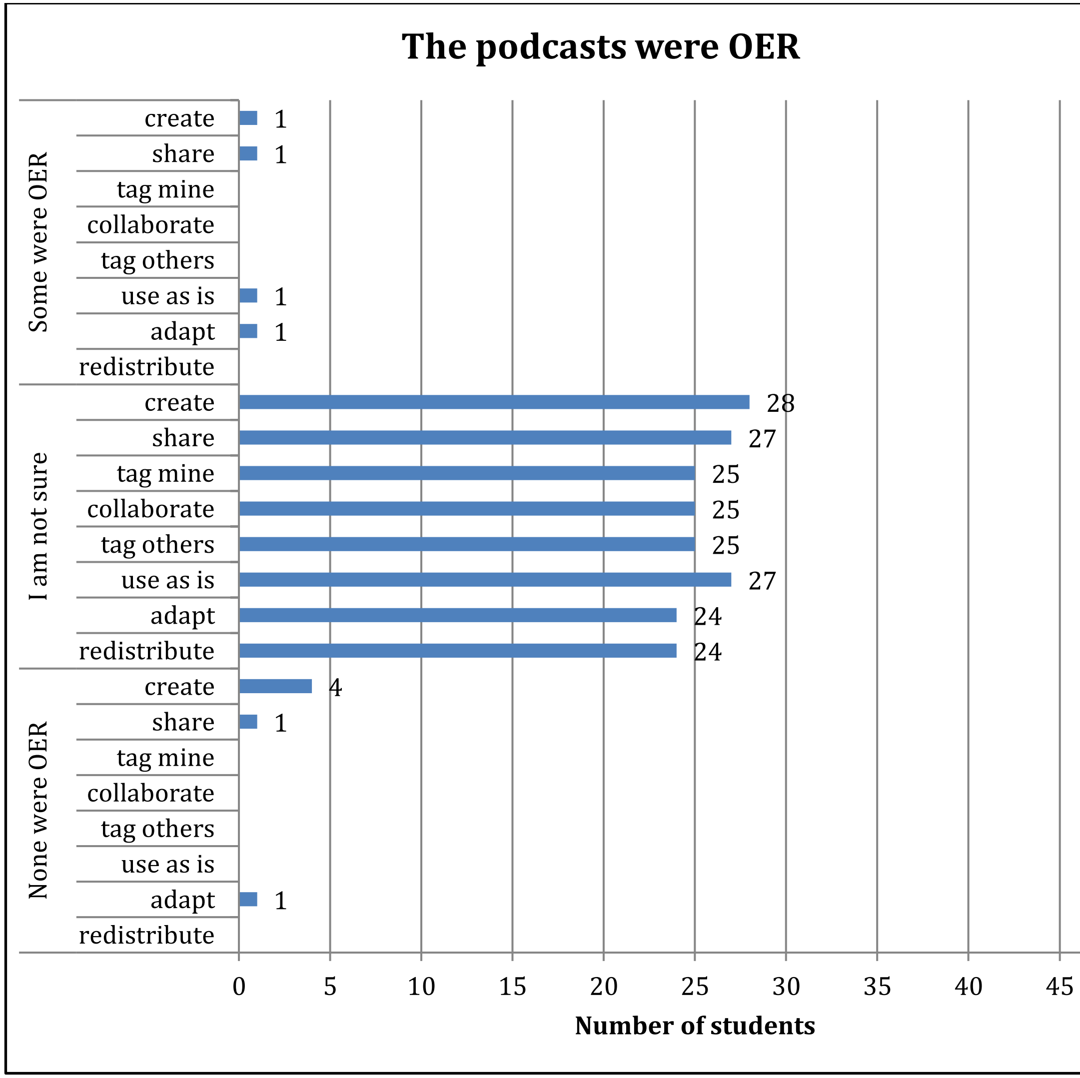

Figure 4: Podcasts used by students

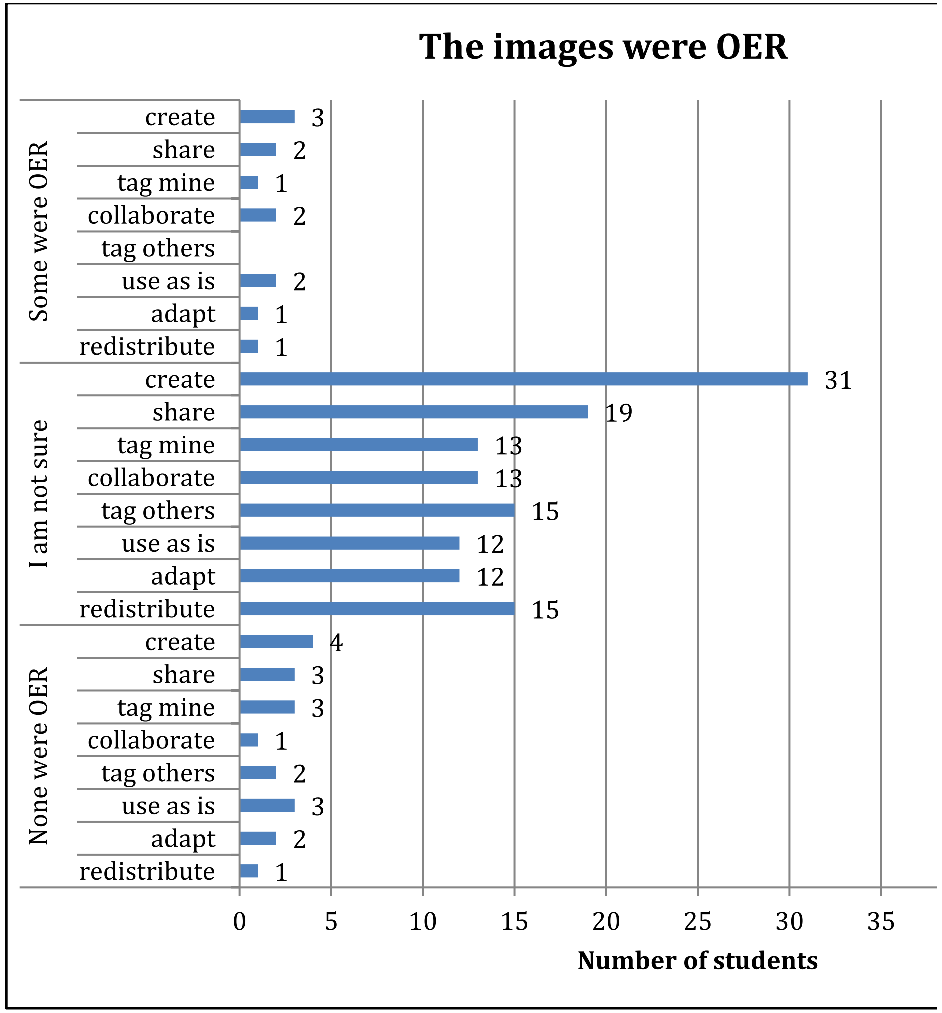

Figure 5: Images used by students

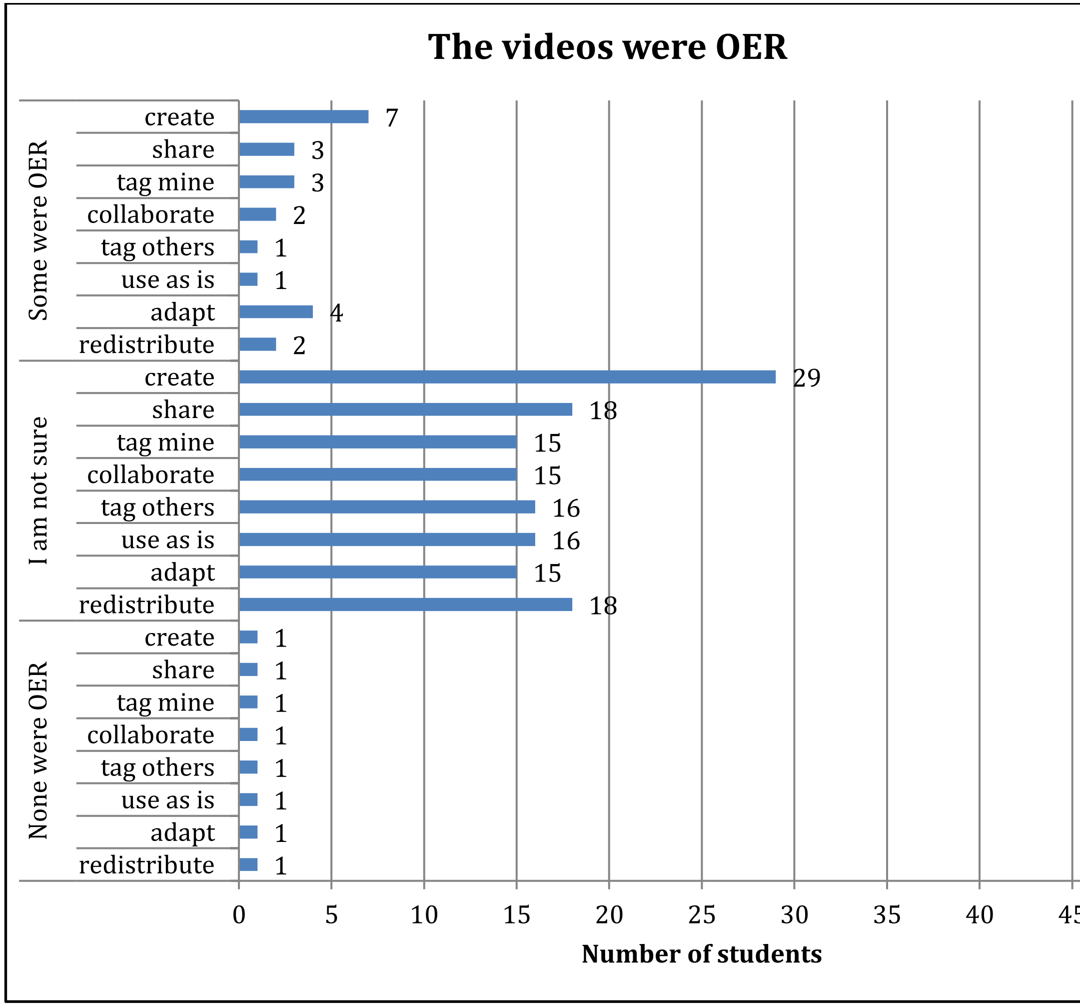

Figure 6: Videos used by students

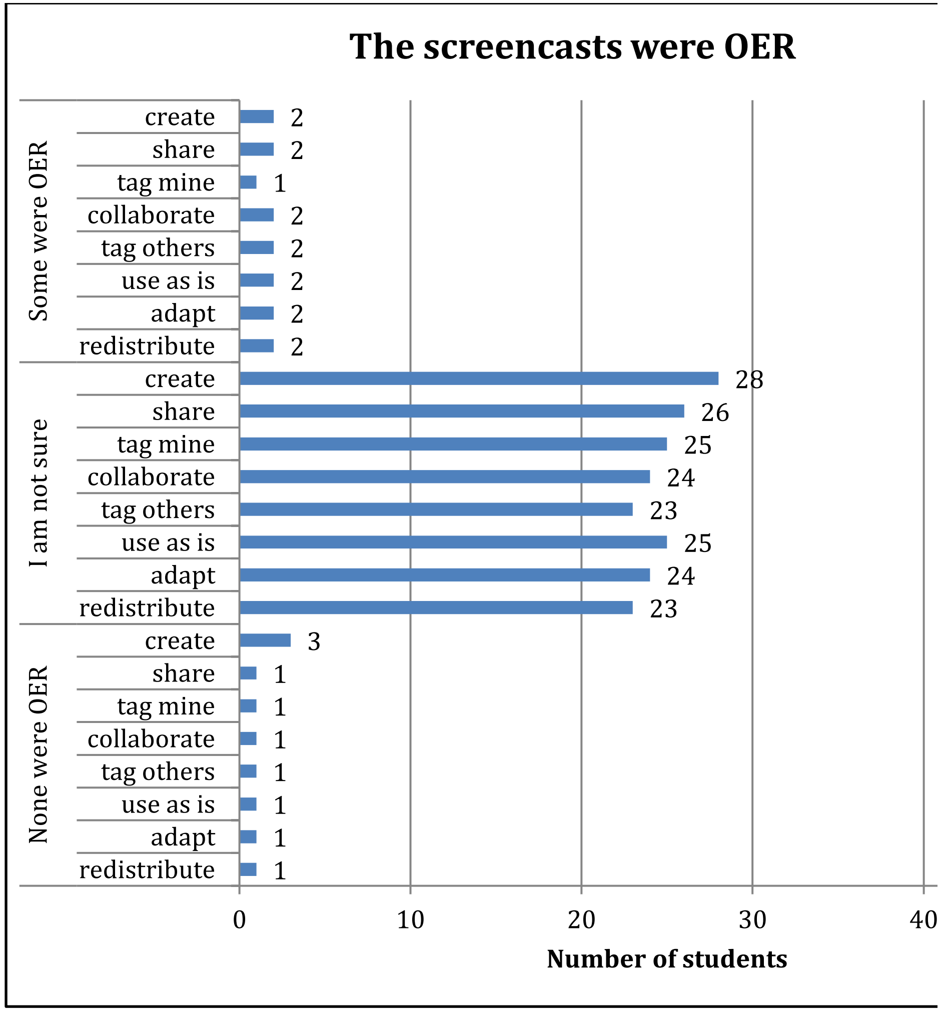

Figure 7: Screencasts used by students

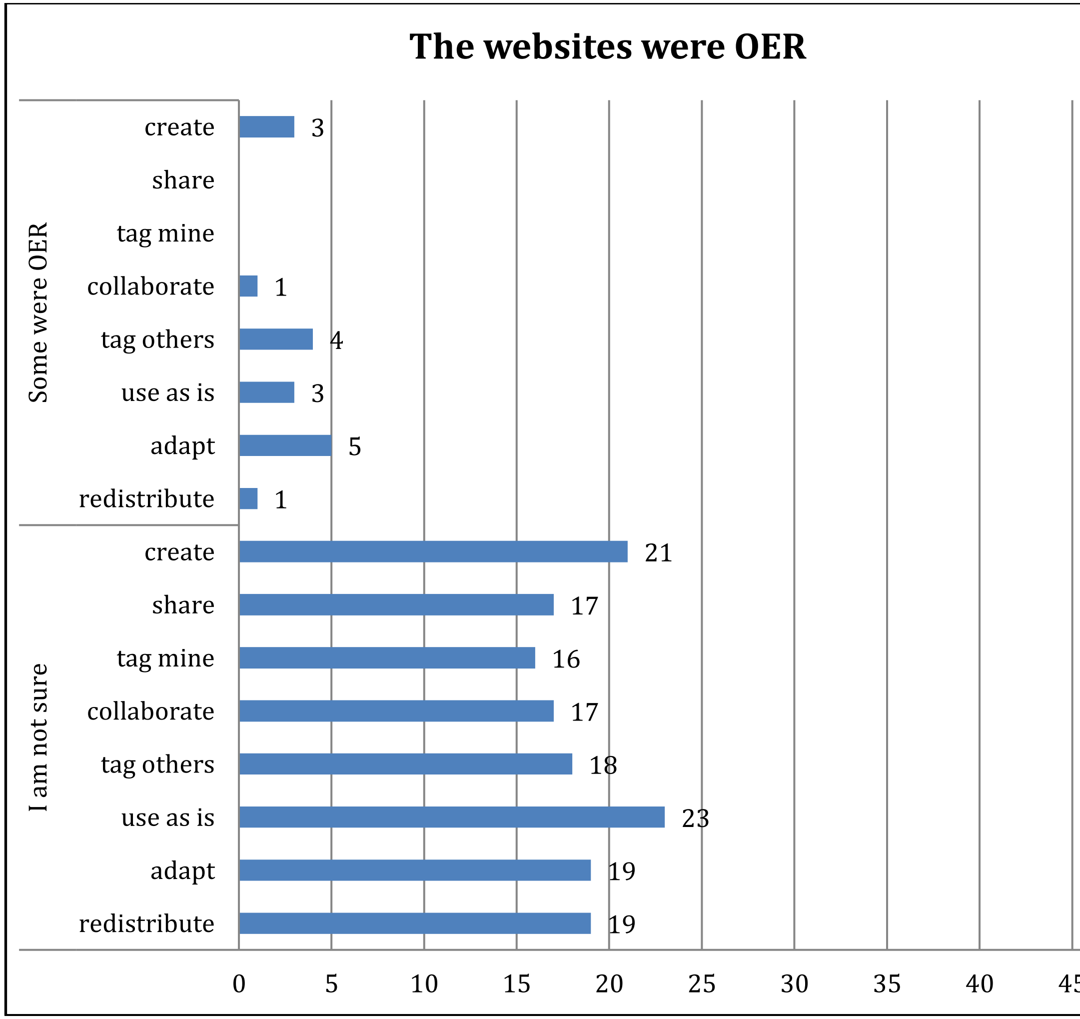

Figure 8: Websites used by students

Appendix K: Student use and/or non-use of resources and software features students

Resource/software features	Commerce N = 11	Humanities N = 16		
	Task	Essay 1	Essay 2	Essay 3
SmartArt	7	0	0	0
Sitemaps	0	0	0	0
Open textbook	0		16	5
YouTube	0	0	0	6
Wikipedia	0	2	1	
Digital news sources (eNCA, Daily maverick, Business Tech)	0	0	0	1
Webpage	Business-related 1	0	Postcolonial site 1	Sabinet Legal 1
Articles	0	3	5	2
Bible	0	1	0	0
Blog	0	1	0	0
Google	0	2	0	0
e-book	0	0	0	1
Policy document, position paper	0	1	0	0
Notes	1	0	0	0
References	1 group	16	16	16

Appendix L: Factors influencing students' digital literacy practices at university

Digital literacy practices	**Responses**	**Pearson Chi-Square test**	**Factors influencing students' digital literacy practices**
Technical dimension (summary of Section 5.4.1)			
Accessing and using devices for learning	Discipline Commerce n = 37 Humanities n= 52	Smartphone $x^2 = 3.829$ $p = 0.05$	Positive correlation between the Commerce students, and owning a smartphone and a laptop
	Discipline Commerce n = 33 Humanities n= 40	Laptop $x^2 = 5.742$ $p = 0.017$	
	Gender Females n = 57 Males n =32	Smartphone $x^2 = 4.052$ $p = 0.044$	Positive correlation between being female and owning a smartphone
Accessing and using internet for learning	Age $\leq$18 years n =21 19 – 24 years n = 41	$x^2 = 9.838$ $p = 0.007$	Positive correlation between younger students and accessing internet from a public library
	Gender Females n = 35 Males n =15	$x^2 = 3.899$ $p = 0.048$	Positive correlation between being a female student and accessing internet from an internet café
Creating word-processed documents and presentations	Discipline Commerce n = 34 Humanities n= 42	Word-processed documents $x^2 = 5.821$ $p = 0.016$	Positive correlation between the Commerce course and student creation of word-processed documents and presentations
	Discipline Commerce n = 26 Humanities n= 27	Presentations $x^2 = 5.813$ $p = 0.016$	

Using other people's spreadsheets without revising them	Age ≤18 years n = 5 19 – 24 years n = 3	Spreadsheet $x^2 = 6.446$ $p = 0.040$	Positive correlation between younger students and using other people's spreadsheets without revising them
Sharing own Google documents	Age ≤18 years n = 6 19 – 24 years n = 4	Google documents $x^2 = 7.186$ $p = 0.028$	Positive correlation between younger students and sharing of Google documents
Sharing own copy of word-processed documents, presentations, spreadsheets and Google documents	Enrolled in a computing-related subject n = 10 Never enrolled in any computing-related subject n = 13	Word-processed documents $x^2 = 11.099$ $p = 0.004$	Positive correlation between enrolling in a computing-related subject and sharing one's own copy of word-processed documents, presentations, spreadsheets and Google documents
	Enrolled in a computing-related subject n = 5 Never enrolled in any computing-related subject n = 5	Presentations $x^2 = 6.662$ $p = 0.036$	
	Enrolled in a computing-related subject n = 5 Never enrolled in any computing-related subject n = 5	Spreadsheets $x^2 = 6.662$ $p = 0.036$	
	Enrolled in a computing-related subject n = 5 Never enrolled in any computing-related subject n = 5	Google documents $x^2 = 6.662$ $p = 0.036$	

Sharing other people's copies of word-processed documents and spreadsheets	Enrolled in a computing-related subject $n = 2$ Never enrolled in any computing-related subject $n = 0$	Word-processed documents $x^2 = 8.464$ $p = 0.015$	Positive correlation between enrolling in a computing-related subject and sharing other people's copies of word-processed documents and spreadsheets
	Enrolled in a computing-related subject $n = 2$ Never enrolled in any computing-related subject $n = 0$	Spreadsheets $x^2 = 8.464$ $p = 0.015$	
Techno-cognitive dimension (summary of Section 5.4.3)			
Producing podcasts	Age ≤18 years $n = 5$ 19 – 24 years $n = 6$	$x^2 = 10.342$ $p = 0.006$	Negative correlation between older students and creating podcasts
Producing images	Discipline Commerce $n = 22$ Humanities $n = 20$	$x^2 = 6.352$ $p = 0.012$	Positive correlation between being a Commerce student and creating images
	Enrolled in a computing-related subject $n = 14$ Never enrolled in any computing-related subject $n = 28$	$x^2 = 9.254$ $p = 0.010$	Positive correlation between enrolling in a computer-related subject and creating images
Adapting other people's presentations and Google documents	Enrolled in a computing-related subject $n = 8$ Never enrolled in any computing-related subject	Presentations $x^2 = 14.782$ $p = 0.001$	Positive correlation between enrolling in a computing-related subject and adapting other people's presentations and Google documents

	n = 6		
	Enrolled in a computing-related subject n = 5 Never enrolled in any computing-related subject n = 3	Google documents $x^2 = 10.307$ $p = 0.006$	
Searching for online information	Discipline Commerce n = 28 Humanities n= 29	Wikipedia $x^2 = 6.876$ $p = 0.009$	Positive correlation between the Commerce course and use of Wikipedia, as well as, the Humanities course and Google Scholar
	Discipline Commerce n = 5 Humanities n= 47	Google Scholar $x^2 = 35.620$ $p = 0.000$	
	Enrolled in a computing-related subject n = 20 Never enrolled in any computing-related subject n = 59	YouTube videos $x^2 = 10.402$ $p = 0.006$	Positive correlation between enrolling in a computing-related subject and searching YouTube for videos, and OER institutional repositories
	Enrolled in a computing-related subject n = 7 Never enrolled in any computing-related subject n = 8	OER institutional repositories $x^2 = 8.407$ $p = 0.015$	
	Age $\leq$18 years n = 10 19 – 24 years n = 5	OER institutional repositories $x^2 = 16.070$ $p = 0.000$	Positive correlation between younger students and use of OER institutional repositories

Cognitive and social-emotional dimension (Summary of Section 5.4.6)			
Collaboratively developing word-processed documents, spreadsheets, presentations, Google documents, images, videos	Enrolled in a computing-related subject $n = 9$ Never enrolled in any computing-related subject $n = 3$	Word-processed documents $x^2 = 26.830$ $p = 0.000$	Positive correlation between enrolling in a computing-related subject and collaboratively developing word-processed documents
	Enrolled in a computing-related subject $n = 7$ Never enrolled in any computing-related subject $n = 3$	Spreadsheets $x^2 = 18.125$ $p = 0.000$	Positive correlation between enrolling in a computing-related subject and collaboratively developing spreadsheets
	Enrolled in a computing-related subject $n = 7$ Never enrolled in any computing-related subject $n = 3$	Presentations $x^2 = 18.125$ $p = 0.000$	Positive correlation between enrolling in a computing-related subject and collaboratively developing presentations
	Enrolled in a computing-related subject $n = 6$ Never enrolled in any computing-related subject $n = 1$	Google documents $x^2 = 21.099$ $p = 0.000$	Positive correlation between enrolling in a computing-related subject and collaboratively developing Google documents
	Enrolled in a computing-related subject $n = 7$ Never enrolled in any computing-related subject $n = 4$	Images $x^2 = 15.414$ $p = 0.000$	Positive correlation between enrolling in a computing-related subject and collaboratively developing images
	Enrolled in a computing-related subject $n = 5$	Videos $x^2 = 28.203$ $p = 0.000$	Positive correlation between enrolling in a computing-related subject and collaboratively

	Never enrolled in any computing-related subject n = 1		developing videos